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**SEISMIC VESSEL MARKET UPDATE**

**Challenges remain for seismic survey vessel market**...20

While much of the offshore industry is slowly rebounding, the seismic vessel survey market continues to be challenging for those contractors that still remain active. And that list has become much smaller in the past few years. Companies have exited the market, filed bankruptcy, and sold their fleets.

**ASIA/PACIFIC**

**Oscilay process speeds production, cuts cost of long-length umbilicals**...24

Aker Solutions has developed a method for manufacturing large power umbilicals that voids the frequent interruptions for splicing that traditionally have slowed down the process. The first deployment will be in 2020 on the deepwater Liuhua subsea tieback in the South China Sea.

**GEOLOGY & GEOPHYSICS**

**Gabon offers wide-ranging blocks, improved terms in latest license round**...29

Gabon is offering 35 blocks over wide-ranging water depths under the country’s 12th Offshore Licensing Round. Four geophysical contractors have put together 3D and 2D seismic data-sets for would-be applicants, which have employed modern processing and imaging methods that reveal potentially large oil and gas accumulations in hitherto untested plays.
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**CONTENTS**

**ENGINEERING, CONSTRUCTION, & INSTALLATION**

Decommissioning market advancing offshore the UK ........................................32

Changing UK continental shelf dynamics offer an invaluable window of opportunity. With decommissioning scheduled to occur over a longer timeline, the country can build on existing specialist skills and expertise. While decommissioning is occurring in other oil and gas provinces around the world, a significant number of UKCS projects are substantial in scale and technically complex.

Employing best practices underpins FPSO project success ........................................35

Although the successful design and implementation of an FPSO on a project is a result of a multitude of decisions and tradeoffs for the operator, experience has proven that using lessons from past projects helps successful completion of current and future projects.

**PRODUCTION OPERATIONS**

Eider bypass project extends lives of North Sea fields .............................................38

Oil production from TAQA’s Eider platform in the UK northern North Sea had become uneconomic after nearly 30 years in service. However, by converting the facility to a new utility role, supplying power to other fields in the area, the company has ensured continued operations at these fields until well into the next decade.

**SUBSEA**

Industry advances ROV and AUV technologies .................................................41

As the offshore oil and gas industry recovers, demand for remotely operated vehicles (ROV) autonomous underwater vehicles (AUV) increases. ROV and AUV manufacturers are responding with new systems that maximize uptime.

**TECHNOLOGY**

Technology gains taking subsea processing deeper, farther out ................................44

Since the release of the first Worldwide Survey of Subsea Processing Technology poster in Offshore in 2008, INTECSEA has monitored the status of the technologies and systems used on the seafloor to enhance reservoir recovery rates. The technologies continue to mature with each successful field development application.

**Vessel-based decommissioning system offers economic alternative ..............47**

Well decommissioning is traditionally performed from drilling rigs due to the complexity of operations and the available technologies and methods, which often include risers, divers, and explosives. But increasingly, operators are looking to a vessel-based approach to not only keep decommissioning project costs down, but also to reduce non-productive time and safety risks to workers.

**EQUIPMENT & ENGINEERING**

Production optimization platform offers enhanced predictive failure analytics ..........49

Crane adapted for deeper water wind farms ......................................................50

Motion compensation technology improves decommissioning operations ..........52

HWCG selects m-pipe for emergency well containment riser ...............................53

**DEPARTMENTS**

Online ...........................................6
Comment ......................................7
Data ...........................................8
Global E&P ....................................9
Offshore Europe ............................12
Gulf of Mexico ................................13
Subsea Systems .............................14
Vessels, Rigs, & Surface Systems ....16
Drilling & Production .................18
Offshore Wind Energy .................19
Business Briefs ............................54
Beyond the Horizon ......................56
Advertisers’ Index .........................63

**COVER:** While much of the offshore industry is slowly rebounding from the downturn, the seismic vessel survey market continues to have its challenges. Yet work is picking up in some regions. Shearwater GeoServices recently secured two North Sea seismic campaigns for its multi-purpose vessels WG Tasman (cover) and WG Cook. The surveys, which will be performed for Aker BP and Equinor, call for four new ocean bottom seismic surveys in the Norwegian North Sea starting this summer. (Courtesy Shearwater GeoServices)
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The latest news is posted daily for the offshore oil and gas industry covering technology, companies, personnel moves, and products.

NEW ON-DEMAND WEBCAST

Top Offshore Projects: Leading strategies in capital efficiency
After a prolonged market downturn, offshore field development projects are once again moving toward first oil. Higher oil prices, cost reductions, technological breakthroughs and strategic engineering have enabled operators to sanction their deepwater developments. In this year’s “Top Offshore Projects” webcast, sponsored by Bentley Systems, Calpipe Industries, LLC, and Wood, the Offshore editors select the projects that have successfully been re-engineered and restructured to succeed in today’s marketplace, and will describe the new technologies and engineering methods that have enabled these projects to move forward.

NEW MAPS, POSTERS, AND SURVEYS
• 2019 Worldwide Seismic Vessel Survey
• 2019 Worldwide Survey of Subsea Processing Technology Poster
• 2019 Status of US Gulf of Mexico Deepwater Discoveries
• 2019 Gulf of Mexico Map
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• 2018 MWD/LWD Services Directory
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NEW VIDEO WHITE PAPER
The Challenges of Maintaining Equipment on Offshore Platforms
The operating environment of an offshore platform offers one of the toughest challenges to the maintenance engineer. Combined with the limited space and remote location of most offshore facilities, the task of delivering cost-effective, efficient and durable equipment requires considerable expertise. With so many production processes involving a multitude of pumps, turbines and motors, it is critical to have a well-developed asset management system to reduce the amount of reactive maintenance on a platform. This white paper, sponsored by Sulzer, highlights potential proactive solutions for prevention.

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www.offshore-mag.com/index/about-us/article-submission.html
Subsea sector benefiting from efficiencies, technology development

DAVID PAGANIE, CHIEF EDITOR

THE CONSENSUS VIEW of many industry analysts is that the subsea sector is leading the offshore growth cycle, with tree orderbooks swelling to levels not seen in years as operators take advantage of low costs. But this enthusiasm is tempered by a supply chain that is still struggling to make ends meet. Nevertheless, the data is encouraging. Operators ordered 286 subsea trees in 2018 – the highest total since 2013, according to Westwood. The firm expects awards for up to 400 subsea trees this year, with a focus on projects in Brazil and emerging deepwater markets in Guyana, Mozambique, and Senegal.

The improvement in the subsea market can be attributed to project simplification and standardization, but it is also an ongoing commitment to technology development. Inside this issue, Offshore reviews a selection of new and developing technologies that are enabling this subsea revival.

Offshore's annual subsea poster insert, developed by INTECSEA and Kurt Albaugh, Offshore volunteer poster editor, looks at the evolution and application of subsea processing and boosting systems. It also outlines the various partnerships and alliances that have emerged to bring the technology to market. One relatively new technology that is being used in the field following a lengthy qualification process is subsea compression. The poster details the two major operational compression projects, Åsgard and Gullfaks South Brent. The early success of these two projects has led other operators to evaluate the technology for their fields.

Pseudo dry gas systems, an alternative to compression, are emerging for long-distance tiebacks of 62 mi (100 km) long or greater. This technology, adapted from surface applications, helps overcome the pressure losses due to gravitational effects in long tiebacks and deep waters.

Subsea water treatment is another technology that is maturing through the technical readiness level process. It is also detailed and described on the poster. This emerging technology can reduce space and equipment on the host topsides, eliminate water injection flowlines and risers, and simplify the subsea hardware for the water injection system.

The poster also chronicles the water-depth and tieback-length progressions of subsea boosting systems. As of Feb. 2019, the Shell-operated Stones facility holds the record for the deepest water depth (9,600 ft/2,927 m), and the Murphy-operated Dal-mation field holds the record for the longest tieback (22 mi/35 km). Both projects are in the US Gulf of Mexico.

The "2019 Worldwide Survey of Subsea Processing" poster is available inside this issue, and at offshore-mag.com/maps-posters. The accompanying article begins on page 44.

Another critical component of a subsea production system is the power umbilical which distributes power from the host platform to seabed production and pumping systems. CNOOC has sanctioned the first commercial run of a new power umbilical manufacturing method for a subsea tieback project in the South China Sea, writes Jeremy Beckman, Offshore editor-Europe. Aker Solutions' Oscilay machine will produce the static sections of the Lihuahua 16-2 power umbilicals, part of a package of more than 71.5 mi (115 km) of dynamic and static power umbilicals the company is supplying that will connect wells at the deepwater Lihuahua 16-2, 20-2, and 21-2 gas-condensate fields to a new FPSO.

The new process has been designed to address the challenges presented by extreme tension loads on umbilicals during installation. An Aker Solutions team in Malaysia is leading the engineering for the Lihuahua project, with a team in Mobile, Alabama, responsible for all production. Final delivery is scheduled for 2020.


Meanwhile, the uptick in subsea development should improve demand for ROVs and AUVs. Jessica Stump, Offshore assistant editor, reviews the latest technology developments in this space. One example is Flatfish, a resident subsea autonomous vehicle designed to perform subsea asset inspections. Shell awarded Saipem a license to develop the technology which should be qualified for commercial application by 2020.

Jessica's report begins on page 41.

While the subsea sector is improving, the subsurface seismic acquisition market continues to be challenging for those contractors that remain active, writes Bruce Beaubouef, Offshore managing editor. A number of seismic vessel operators over the past few years have exited the market or were forced to file for bankruptcy. Offshore has refreshed its seismic vessel survey, last published in 2015, to get a feel for the state of the market. Bruce's seismic vessel report and survey begins on page 20.

To respond to articles in Offshore, or to offer articles for publication, contact the editor by email (davidp@pennwell.com).
Worldwide offshore rig count and utilization rate
The offshore rig market experienced modest improvements across every category during January. The total number of jackups, semis, and drillships under contract grew by two units to 432 rigs. However, it has been at roughly this same level for several months now. Meanwhile, five more rigs have been removed from the global fleet, taking the total supply down to 759. As a result, rig utilization had a bump up to 57.0% from 56.3% in December. The number of rigs working experienced a similar increase, climbing from 398 units in December to 402 in January.

– Justin Smith, Petrodata by IHS Markit

Merakes sparks hope for long-delayed Indonesian projects
The recent final investment decision (FID) for the Eni-operated Merakes gas discovery in Indonesia has set the ball rolling for getting projects sanctioned from the country’s long list of delayed projects.

Indonesia has Southeast Asia’s largest FID count in forecast with 24 fields expected to be sanctioned within two years. The cumulative development costs for these projects would be around $6.4 billion.

Considering the decline in existing mature fields in Indonesia and the growing domestic energy demand, developing these major projects is becoming a higher priority item as time passes.

It will be interesting to see if some of the long-delayed projects can come off the back burner with lower project costs and improved planning. The recent push from the government and ministry regarding the Merakes and other projects, the new profit-sharing scheme, and an improving price scenario imply more pending projects are likely to be sanctioned going forward.

– Prateek Pandey, Senior Analyst, Rystad Energy

Offshore rig contracting momentum continues to build
In January, 55 rig contracts were confirmed, according to Evercore ISI’s latest “Offshore Rig Market Snapshot.” This is up 19 from a year ago for the fifth highest monthly total since 2014. With four of the top five monthly fixture counts taking place in the past 12 months, the analyst said, offshore rig contracting momentum is clearly building. If the YTD pace of activity extends through 2019, contracting activity is on track to increase another 27% in 2019 (+30% jackups, +20% floaters).

– Offshore Rig Contract Count

Source: IHS Markit RigPoint

Note: Rig types included are jackups, semis, and drillships

INDONESIA FID VOLUMES 2010-2021

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– Justin Smith, Petrodata by IHS Markit
NORTH AMERICA

BHP has committed $256 million for further drilling later this year and studies on the deepwater Trion oilfield offshore Mexico. Results from the recent 2DEL appraisal well reduced uncertainties but another well will be needed to firm up volumes ahead of a potential development.

Excelerate Energy and Equinor Energy have completed what is claimed to be the first ship-to-ship transfer of LNG offshore the Bahamas. This involved the floating storage and regasification unit Exemplar and the LNG carrier Arctic Voyager while both were moored at Equinor’s South Riding Point storage and transshipment terminal.

CARIBBEAN SEA/SOUTH AMERICA

Brazil, Guyana, and Mexico will continue to lead the way this year in terms of high-impact exploration drilling, according to Wood Mackenzie. The stand-out program will likely be on the Petrobras-operated Peroba prospect in the presalt Santos basin offshore Brazil, where volumes could exceed 5 Bboe. The consultant also highlighted Tullow Oil’s upcoming well on the 200-MMboe Jethro structure well on the Orinduik block off Guyana.

BP has commissioned McDermott International to construct and install a new gas compression platform at the Cassia complex in the Columbus basin, 35 mi (57 km) southeast of Trinidad. McDermott will fabricate the 8,928-ton (8,100-metric ton) topsides and the bridge that will link the structure to the existing Cassia B platform at its yard in Altamira, Mexico. Trinidad Offshore Fabrication Co. will provide the 3,747-ton (3,400-metric ton) jacket, to be installed in 223 ft (68 m) of water. The new Cassia C facility’s three turbine-driven compressors will receive 1.2 bcf/d through new piping across the bridge connection, returning the compressed gas to Cassia B for export.

ExxonMobil and its partners have continued their run of successes in Guyana’s offshore Stabroek block. Wells on the Tilapia and Haimara prospects delivered respectively oil and gas-condensate, with Tilapia-1 representing the fourth commercial oil find in the Turbot area. ExxonMobil now sees potential for at least five FPSOs on the block by 2025, producing more than 750,000 b/d combined.

Petrobras has started operations at the FPSO P-67 in the Lula Norte area, the ninth production platform on the BM-S-11 block in the presalt Santos basin. The location is 161 mi (260 km) from the Rio de Janeiro state coast in 6,988 ft (2,130 m) water depth. Up to 150,000 b/d of oil from nine production wells will
be offloaded to shuttle tankers, with associated gas sent through the existing presalt subsea pipeline network. By year-end, Petrobras expects output from all the facilities on the Lula field to have reached 1 MMB/d.

In the same basin, but closer to the coast, the company has contacted TechnipFMC to supply the rigid pipeline/riser network for the presalt Mero-1 field development in 6,890 ft (2,100 m) water depth, also including the flexible risers and flowlines, steel tube umbilicals and other subsea equipment. MODEC, which is constructing the field’s FPSO Guanabara MV31, has subcontracted Estaleiros do Brasil to fabricate and assemble the topsides process modules at the EBR shipyard in São José do Norte. The vessel is designed to process up to 180,000 b/d of oil and 12 MMcfd of gas.

WEST AFRICA
GeoPartners is collaborating with Sierra Leone’s Petroleum Directorate on a new 5,592-mi (9,000-km) 2D seismic survey to be acquired over the country’s entire offshore area. The resultant data will be made available to bidders for the country’s 4th Offshore Petroleum Licensing Round which is due to launch later this year.

Results from the latest well on the Pecan field offshore Ghana and supplementary analysis point to discovered resources of 450-550 MMboe across the Deepwater Tano Cape Three Points block. Pending the outcome of two further planned appraisal wells, operator Aker Energy sees scope to increase the range to 600-1,000 MMboe, with other targets on the block potentially included in an area-wide development. Water depth at the Pecan-4A well location was 8,750 ft (2,667 m).

The FPSO Kwame Nkrumah has successfully been rotated to a new heading of 205° at the Jubilee field offshore Ghana. Operator Tullow Oil commissioned a remediation program after detecting issues with the turret bearing system. Next year, a new catenary anchor leg mooring buoy is due to be put in place for offtake of the vessel’s produced oil.

Nigeria’s government has renewed the license for the offshore OML 113 concession by a further 20 years. Operator MX Oil is looking to step up production from the Aje field by drilling new wells in the Cenomanian and Turonian intervals, eventually lifting output to 20,000 b/d of oil and 100 MMcf/d of gas.

Seadrill and an affiliate of Angolan state oil company Sonangol have formed a new venture named Sonadrill. This will operate four drillships with a focus on opportunities offshore Ghana. Sonangol will contribute two new ultra-deepwater 7th generation vessels, Libongos and Quenguela, both under construction at DSME in South Korea. Seadrill will manage and operate all four drillships, initially over a five-year term.

Total has proven potentially large volumes of gas-condensate in the Brulpadda prospect off the southern coast of South Africa. The well, drilled by the semisub Deepsea Stavanger on block 11B/12B in the Outeniqua basin, encountered hydrocarbons in two separate intervals. It was the French major’s second attempt to drill, having had to abandon its first shot in 2014 due to poor weather.

The company and its partners plan to follow up with a 3D seismic survey and four more exploratory wells on the license. Brulpadda, thought to hold up to 1 Bboe, may have a ready market at PetroSA’s Mossel Bay onshore gas-liquids plant, 112 mi (180 km) to the northwest.

MEDITERRANEAN SEA
BP has started gas production from the Fayoum and Giza fields in the West Nile Delta (WND concession). Development involved drilling eight wells and installing associated subsea infrastructure and pipelines, with combined output from the two fields eventually set to reach 700 MMcf/d. Four fields are now onstream in WND, with the fifth – Raven – to follow later this year. Total peak output will be 1.4 bcf/d, all contracted to Egypt’s domestic market.

Tunisia’s Directorate General of Hydrocarbons has agreed to renew Panoro Energy’s Sfax Offshore exploration permit. The
Norwegian company and partner ETAP are working on a program of drilling and testing of the offshore Salloum West-1 well, investigating a fault compartment updip of British Gas’ 1992 Salloum oil discovery. If successful, Salloum could be developed fasttrack through nearby infrastructure.

Egyptian General Petroleum Corp. has reportedly awarded exploration rights to three promising concessions in the Mediterranean Sea to various consortia under Egypt’s 2018 Bid Round. ExxonMobil, BP, IEOC (Eni), Total, Shell, and Petronas secured block 3 – North East El Amreyia and have agreed to drill two wells. BG (Shell) and Petronas were awarded block 4 – North Sidi Gaber and have pledged to acquire 579 sq mi (1,500 sq km) of 3D seismic and to drill one well. The same duo picked up block 6 – North El Fanar, where the program includes an 869-sq mi (2,250-sq km) seismic survey.

EASTERN EUROPE
Black Sea Oil & Gas and its partners have decided to proceed with the $400-million Midia gas project in the Romanian sector of the Black Sea. They plan five production wells – four surface wells at the Ana field and one subsea well at the Doina field – with production from Doina heading through an 11-mi (18-km) subsea pipeline to a new unmanned production platform at Ana. From there, a new 78-mi (126-km) pipeline will transport the gas to a new 1 bcm/yr onshore treatment plant in Corbu, Constanta county, for onward delivery through the Romanian grid. GSP Offshore will construct, install and commission all the facilities.

The same contractor has been working for Turkish gas distributor BOTAS drilling subsea storage wells and supervising construction of two fixed offshore platforms under Phase III of the Marmara natural gas storage extension project. These facilities should increase storage capacity from the present 2.84 bcm to 4.3 bcm.

EAST AFRICA
Anadarko Petroleum and its partners in Area 1 offshore Mozambique have signed separate long-term agreements to supply LNG converted from the deepwater Golfinho/Atum gas fields to India’s Bharat Gas Resources, Shell International Trading Middle East, and Tokyo Gas/Centrica. The total volume contracted could reach up to 5.6 MM metric tons/yr (6.17 MM tons). The partners plan to initially construct two LNG trains onshore Mozambique with an annual capacity of 12.88 MM metric tons (14.2 MM tons). A final investment decision on the project should follow by mid-year.
DOCK DEVELOPMENT TARGETS RIG STAYS
PSW Group and Wergeland Holding have started construction of a new drydock in western Norway to accommodate offshore drilling rigs and vessels. The facility in Gulen Industrial Harbor, due to be completed in 2020, will be used for wide-ranging programs related to inspection, repair, and maintenance. Potentially the length could be extended by 50% to 300 m (984 ft): combined with a width of more than 100 m (328 ft) and a depth of 25 m (82 ft) this would be the largest facility of its kind in Europe, PSW claimed, with access to rigs and vessels from three sides leading to shorter yard stays.

CNOOC FINDS BIG GAS AT THIRD ATTEMPT
CNOOC's recent Glengorm gas-condensate discovery could tempt others to test the surrounding play fairway in the UK central North Sea, according to various analysts. This was the company’s third attempt to drill the prospect on the P2215 license after technical issues halted both previous operations. Borr Drilling’s harsh environment jackup Prospector 5 spud the latest well toward the end of last year in 80 m (262 ft) of water on the way to a final depth of 5,056 m (16,588 ft), encountering 37 m (121 ft) of pay in an Upper Jurassic reservoir. Results were at the top end of expectations said CNOOC’s partner Total, suggesting close to 250 MMboe recoverable.

Glengorm appears to be the UK’s largest offshore gas find since Maersk’s Culzean in 2008 said Wood Mackenzie and succeeded despite very high downhole temperatures and pressures. Another consultant, Westwood, added that this could be one of the sector’s top four discoveries of the past two decades, the others being Buzzard in the same region and the still undeveloped Rosebank oil field west of Shetland. Westwood’s Dr Keith Myers pointed out that the geological setting – Upper Jurassic turbidites – has in the past proven to be variable in this area in terms of thickness and quality. Like other nearby HP/HT structures, Glengorm is likely to be compartmentalized, he suggested.

The partners plan follow-up appraisal work and have identified other Jurassic prospects elsewhere on the block. As the Culzean field center, due onstream later this year, comes off plateau in 2023, capacity could become available for a subsea tieback. Myers said. Other tie-in options may include Total’s Elgin-Franklin complex, which is closer, and BP’s ETAP hub to the northwest. But CNOOC may prefer a standalone development. Rystad Energy said the results of this well will likely turn the area into an exploration hotspot over the next few years, building on the UK’s strong exploration drilling record since 2016.

MORE TIEBACKS TO GJØA
Neptune Energy is looking to extend the life of the Gjøa field semisubmersible platform in the North Sea via two further satellite developments, in addition to the ongoing Nova field tieback. It has submitted plans to develop the P1 segment on the northern part of the Gjøa field and the 2016 Duva (ex-Cara) discovery to the northeast, where it proposes one gas and two oil production wells connected to a four-slot subsea template in 360 m (1,181 ft) water depth. In both cases, production through the platform could begin in late 2020/early 2021, with peak combined output of 54,000 boe/d.

Lundin Norway is the latest taker for TechnipFMC’s integrated engineering, procurement, construction, and installation (iEPCI) model. The company has appointed the contractor to manage the Luno II and Rolvsnes subsea development in the Utsira High region of the North Sea, supplying and installing subsea production systems, rigid flowlines, umbilicals, and flexible jumpers in 110 m (361 ft) of water. All will be tied back to the Edvard Grieg field platform.

TULIP GAS FIELD GOES LIVE
Tulip Oil Netherlands has started production from Q10, its first operated gas field development in the Dutch North Sea, a year after taking a final investment decision. Heerema Fabrication Group supplied the unmanned platform, with Borr Drilling’s jackup Prospector-1 responsible for the five development wells. Production heads to the TAQA-operated P15 platform via a new 42-km (26-mi) pipeline laid by Allseas. Tulip discovered Q10 (formerly known as A07A) in 2015 in shallow water, 20 km (12.4 mi) from the central Dutch west coast.
BOEM DETAILS NEXT REGION-WIDE GULF OF MEXICO LEASE SALE

The Bureau of Ocean Energy Management will offer 78 million acres in a region-wide lease sale this month.

Lease Sale 252 will include all available unleased areas in federal waters of the Gulf of Mexico. The sale will include about 14,696 unleased blocks, located from 3 to 231 mi (5 to 372 km) offshore, in the Gulf’s Western, Central and Eastern planning areas in water depths ranging from 9 to more than 11,115 ft (3 to 3,400 m).

The sale, scheduled to be livestreamed from New Orleans, will be the fourth offshore sale under the 2017-2022 national outer continental shelf oil and gas leasing program.

The Gulf of Mexico OCS, covering about 160 million acres, is estimated to contain about 48 Bbbl of undiscovered technically recoverable oil and 141 tcf of undiscovered technically recoverable gas, according to BOEM.

SENTINEL MIDSTREAM PROPOSES DEEPWATER CRUDE OIL EXPORT FACILITY

Sentinel Midstream has outlined its planned development of Texas GulfLink, a deepwater crude oil export terminal near Freeport, Texas.

The completed facility will be capable of fully loading very large crude carriers, the company said.

Texas GulfLink will include an onshore terminal with up to 18 MMBbl of storage, a 42-in. offshore pipeline, and a manned offshore platform to facilitate port operations with two catenary anchor leg mooring single point mooring buoys. The company said projected export loading rates will be up to 85,000 b/hr, with a nominal capacity of 1.2 MMB/d over the course of a calendar year.

Sentinel Midstream President and CEO Jeff Ballard said: “Texas GulfLink will provide the United States with an economical solution to clear the over-supply barrels destined for the Gulf Coast. We have compiled a team of industry leading professionals who possess unique experience in construction and operations of deepwater ports and are well positioned to leverage that experience as prudent operators.

“Our team of seasoned professionals is committed to developing Texas GulfLink with a specific focus on exceeding industry standards for safety and environmental protection.”

Over the past year, the company developed Texas GulfLink in conjunction with multiple stakeholders, including federal, state, and local agencies. The project has secured necessary commercial support to justify the capital investment and is preparing its submission of a formal permit with the United States Maritime Administration (MARAD).

Project financing is being provided by Cresta Fund Management.

Cresta Managing Partner Chris Rozzell said: “We view the company’s value proposition, which provides a neutral infrastructure solution without the inherent conflicts of affiliated marketing, as the best approach to support the interests of US producers and lead to the greatest outcome for all stakeholders.”

LLOG COMMISSIONS MCDERMOTT FOR STONEFLY SUBSEA TIEBACK

LLOG Exploration Co., LLC has awarded McDermott International Inc. an EPCI contract for the Stonefly subsea tieback to the Ram Powell TLP in the deepwater Gulf of Mexico.

Located about 140 mi (225 km) southeast of New Orleans in Viosca Knoll block 999, the Stonefly development calls for a two-well subsea tieback to the Ram Powell platform via 60,000 ft 6-in. pipeline at water depths ranging from 3,300 to 4,100 ft (1,006 to 1,250 m).

The scope of work includes project management, installation engineering, subsea structure and spoolbase stalk fabrication, and installation of the subsea infrastructure. McDermott will also design, fabricate, and install a steel catenary riser, a pipeline end manifold, and two in-line sleds.

Structure design and installation engineering began in January in McDermott’s Houston office. The North Ocean 105 vessel is expected to install the subsea infrastructure in 3Q 2019.

GULFSLOPE UPDATES DRILLING AT TAU PROSPECT

The Tau prospect well has drilled through about 7,000 ft (2,134 m) of salt where high pressures and hydrocarbons near the base of salt were encountered and significant mud losses occurred, according to operator GulfSlope Energy Inc.

The company is currently tripping for a different drilling assembly to clean out the existing wellbore and possibly run casing prior to drilling below salt.

The Tau prospect well targets multiple Miocene sand levels trapped against a well-defined, angled flank of the large salt structure. The correlative target subsalt Miocene sand levels are oil productive at the nearby subsalt Mahogany field.

Tau is the first of eight drill-ready exploratory prospects that the company intends to drill along the Louisiana outer continental shelf, targeting the subsalt Miocene play.

GulfSlope is the operator with a 20% working interest. Delek GOM Investments LLC owns a 75% working interest and Texas South Energy Inc. owns a 5% working interest.
**JIP TO DEVELOP BEST PRACTICE FOR TOP TENSION RISERS**

2H Offshore has launched a joint industry project (JIP) with Anadarko, BP, and Shell to develop top tension riser (TTR) reassessment and life extension guidance. The main aims of TRACS (tensioned riser assessment for continued service) are to develop a road map for assessing issues related to fitness for service of TTRs and to provide recommendations for mitigation of potential issues.

The JIP will then apply data from case studies supplied by the participants to validate the methodology and provide documented examples for future guidance.

Currently, according to 2H Offshore, there is no single guideline in the US addressing in detail TTR reassessments and life extension programs.

The JIP will adopt both Bureau of Safety and Environmental Enforcement and API frameworks to pursue industry consensus on the analysis and inspection data and documents needed for assessing the potential for extended service life.

Along the way it will address issues such as fatigue, corrosion and change of service, and will put together recommendations for mitigation measures for each issue, taking into account environmental and operational histories.

In addition, the JIP will examine the latest analysis, inspection and monitoring tools to help deliver an accurate assessment of equipment condition.

Sandeep Jesudasen, subsea riser engineering leader at BP, said: “As deepwater facilities age, the industry needs to look at continued service assessment and life extension to facilitate sustained safe production.”

**TECHNIPFMC NETS PETROBRAS CONTRACT**

Petrobras has awarded TechnipFMC an EPCI contract for the Mero 1 presalt field development in 2,100 m (6,890 ft) of water in the Santos basin offshore Brazil. This covers engineering, procurement, construction of all rigid lines, and installation and pre-commissioning of the infield riser and flowline system for interconnecting 13 wells (six producers and seven water alternate gas injectors) to the FPSO. It also includes installation of rigid pipelines (including corrosion-resistant alloy and steel lazy wave risers), flexible risers and flowlines, steel tube umbilicals, and other subsea equipment.

**ROV/AUV SYSTEM PROVES DOCKING CAPABILITY**

Saab Seeye has successfully docked its iCON-based Sabertooth AUV/ROV at a deepwater docking station to receive data transfer, assignment instructions, and battery charging. The company claims this is a breakthrough for the offshore market, which has been monitoring developments in remote residency technologies because of the potential operational and financial benefits.

During trials the 3,000-m (9,842-ft) water depth rated Sabertooth, fitted with a Blue Logic 2kW charger/inductive device, was able to dock in a safe and controlled manner, both in the horizontal and vertical plane.

Jan Sjesjö, chief engineer at Saab Seeye, Sweden, said the vehicle was the only one available capable of hovering both in ROV and AUV mode, and of undertaking long-term residency operations in difficult to access locations.

The Sabertooth can be based at a remote location docking station ready to be launched on pre-programmed or human-controlled missions, which include inspection, repair and maintenance, research tasks, and environmental monitoring. At the docking station, tooling packages are stored, batteries recharged, and data transferred via satellite or cable to shore.

**SUBSEA LIFTING SYSTEM COMPLETES PRE-TRIAL TESTS**

Ecosse IP Ltd’s latest subsea lifting product, the Ambient Lifter, has completed pre-trial tests in Buckie Harbor, northeast Scotland. This was a follow-up to trials completed last September when it lifted a 5-metric ton load from the seabed. Building on the results, EIP’s engineering team scaled up the system by doubling its lifting capacity to 10 metric tons and adding an ROV garage and docking interface. The company plans full harbor trials this month.

Dorothy Burke, EIP’s managing director, said: “We are delighted The Oil & Gas Technology Centre is supporting our next trials and also look forward to working with Oceaneering and Aeron on the next phases through to commercialization.”
As your trusted decommissioning partner, Oceaneering does things differently, creatively, and smarter. From providing discrete tools to offering a turn-key, end-to-end decommissioning solution, our track record is based on reliable cutting services and complimentary tooling. We can handle large work scopes including vessel services, ROV, tooling, and project management.

By working together will we safely and reliably re-shape the future of the oil and gas industry.

Connect with what’s next at oceaneering.com
TELFORD OFFSHORE ACQUIRES SEVEN VESSELS
Telford Offshore has acquired a DP-3 pipelay and accommodation vessel and six offshore support vessels following a legal settlement between Sea Trucks Group (STGL in liquidation) and West African Ventures. The transaction brings the company’s DP-3 fleet to five.

The DP-3 vessel, Jascon 30, is set to be dry-docked and upgraded in preparation for use worldwide under its new name, Telford 30. The vessel is expected to be ready for deployment later this year.

The six offshore support vessels, which are all anchor handlers, will be deployed in Nigeria with the company’s partner Afrimarine Charters. They will be prepared to start work on projects during 1Q 2019 as Telford moves to increase its presence and commitments in Nigeria and West Africa.

MAERSK SUPPLY SERVICE COMPLETES FLEET RENEWAL PROGRAM
Kleven has delivered the Maersk Maker, the sixth and final vessel of Maersk Supply Service’s Starfish AHTS newbuild series.

The Maersk Maker is a DP-2 deepwater anchor handling tug supply vessel (AHTS) of SALT design. Powered by five medium speed engines with total output of more than 23,000 horsepower, a fuel efficient and flexible hybrid propulsion system and fixed pitch on all side Thrusters, the vessel is said to provide good fuel economy, low emissions, and good station keeping capabilities (ERN 4 x 99).

Also designed for high safe deck operations, the vessel is equipped with a multi deck handler system, anchor recovery frame, gypsy handling system and other aids.

The vessel’s arrival completes the company’s fleet renewal program, with 10 newbuild vessels delivered and 23 vessels divested over the last three years. Since March 2017, six M-class AHTS vessels of the Starfish series and four I-class subsea support vessels of the Stingray series have joined the Maersk Supply Service fleet. Both vessel series, the company says, have been designed to optimize reliability, energy efficiency, comfort, and safety.

The average age of the company’s current 44-vessel fleet has been reduced to less than 10 years. The fleet consists of 30 AHTS vessels, 12 subsea support vessels, and two platform supply vessels.

NOBLE BUYS SECOND NEWBUILD JACKUP FROM PAXOCLEAN
Noble Corp. plc has exercised an option for the purchase of a second newbuild Gusto MSC CJ46 design jackup rig from the PaxOcean Group for $83.75 million.

Like the Noble Johnny Whitstine, which it purchased last September in connection with a Saudi Aramco contract, the newbuild CJ46 design jackup, to be named the Noble Joe Knight, was built at the PaxOcean Graha shipyard in Batam, Indonesia.

The rig is built for operations in moderate drilling environments and can operate in water depths of up to 375 ft (114 m), with well depths of 30,000 ft (9,144 m). The rig features a modern drilling control system, along with a versatile cantilever skidding system and two BOPs.

The Noble Joe Knight will be relocated to a shipyard in Singapore for commissioning and final outfitting ahead of the expected start of operations during 3Q 2019 under a three-year primary term contract, plus a one-year option, with Saudi Aramco.

Julie J. Robertson, chairman, president and CEO of Noble Corp. plc, said: “The CJ46 design is an ideal drilling unit for many applications in the Middle East...”

LIZA FPSO EXPECTED TO SAIL-AWAY THIS SUMMER
SBM Offshore has issued an update on its FPSO construction programs.

In the Fast4Ward program, the company’s first standard, multi-purpose hull is progressing well and according to schedule at the Shanghai Waigaoqiao Shipbuilding and Offshore (SWS) shipyard in China. Last November, the company contracted the SWS shipyard to build the second hull for which progress is in line with expectations. Due to anticipated demand, SBM has progressed negotiations to start work on its third standard, multi-purpose hull. These negotiations are expected to be closed in 1Q 2019.

Construction of the FPSO Liza Destiny at Keppel Shipyard in Singapore is progressing well, the company said. The last modules were lifted on board and commissioning activities are under way. Sail-away is planned for this summer so that the vessel can be installed offshore Guyana later in the year.

In Guyana, work is under way with respect to operations readiness, setting up the shore base and delivering on its local content commitments.

The company added that with engineering now nearly completed, the fabrication of the turret mooring system for the Johan Castberg FPSO is well advanced in Dubai. It remains on track to meet Equinor’s schedule with delivery in early 2020.
Revolutionary ACD provides consistent seal performance

Plan efficiently and enhance the safety and performance of deepwater MPD with our next generation Active Control Device (ACD). Its revolutionary pressure-sealing system provides constant wellbore sealing without bearings or rotating components. As the seal sleeve wears, pressure is actively applied to maintain a consistent seal, saving both time and money. Performance-proven technology that mitigates the risk of unplanned events while drilling challenging hole sections—so you can advance with confidence.

afglobalcorp.com/drilling
STENA FORTH TO DRILL JETHRO-LOBE OFFSHORE GUYANA

The partners in the Orinduik block offshore Guyana have contracted the drillship Stena Forth for their first exploration well.

After completing its current program offshore West Africa, the rig is set to spud the well on the 250-MMbbl Jethro-Lobe prospect in June, close to and up-dip from numerous discoveries in the deepwater Stabroek block and in the same proven resource intervals.

According to one of the block partners Eco (Atlantic) Oil and Gas, the agreement with contractor Stena also defines a window for a second well after Jethro-Lobe has been drilled.

Colin Kinley, Eco Atlantic’s COO, said: “While the Jethro-Lobe is a Tertiary target, which we believe is similar to the Exxon Hammerhead discovery that appears to extend onto Orinduik, we will also drill down to test the Cretaceous section below Jethro.”

ANALYST SEES UPTICK IN EXPLORATION DRILLING, POSSIBLE LARGER FINDS

Various offshore exploration wells planned this year could lead to ‘elephant’ finds, according to consultant Rystad Energy.

“Renewed optimism in exploration activities is anticipated in 2019, with operators from various segments aiming for multiple high-impact campaigns...in essentially all corners of the world,” said senior analyst Rohit Patel. “These include wells targeting large prospects, play openers, wells in frontier and emerging basins, and operator communicated high impact wells.”

Rystad’s new High Impact Wells Report lists the top wildcats to watch over the coming year.

Offshore Papua New Guinea, the Mailu-1 well will target a giant carbonate oil prospect which if successful, could open a new ultra-deep offshore play.

Eni’s Kekra-1 well is Pakistan’s first ultra-deepwater well in over a decade (potentially 1.5 Bbbl).

Dana Gas plans to make its debut as an offshore operator in the deepwater Egyptian sector of the Mediterranean with the Merak well.

Off Morocco, Chariot Oil & Gas’ Moh-B well will test a prospect that could hold 637 MMboe.

The Central Tano-1 well offshore Ghana will target up to 2.3 Bbbl of oil, while offshore Namibia, Total’s well on the Venus prospect will be the deepest anywhere to date offshore Africa, Rystad claimed.

Venus, also considered to be the largest prospect drilled so far off Namibia, is in a giant basin floor fan of the Orange basin.

West of Shetland, Hurricane Energy is set to drill a deepwater well on a prospect with a pre-drill estimate of 935 MMboe – the company is said to have indicated a 77% chance of success.

The Dunquin South well offshore western Ireland will pursue hydrocarbons in lower Cretaceous carbonate reservoirs in water depths of 1,500 m (4,921 ft). Here the pre-drill estimate is for up to 1.4 Bbbl of oil.

In the Gulf of Mexico, Total plans a well on the ultra-deepwater Etzil prospect, which has a 2.7 Bboe pre-drill resource estimate. Offshore French Guiana, the company is set to commit $114 million to drill the Nasua-1 ultra-deepwater well (1 Bboe pre-drill).

Finally, Shell will drill the Gato do Mato presalt prospect off Brazil, which the company bid for in the second presalt licensing round in 2017.

“In 2018 we saw that the decline in offshore exploration activity came to an end,” Patel said.

“The total number of offshore exploration wells last year was 325, compared to around 335 in 2017. For 2019 we expect that around 400 offshore exploration wells will be drilled.”

TRANSOCEAN TO UPGRADE FIVE MORE SEMIS WITH DRILLING AUTOMATION

Transocean Ltd. has entered into an agreement with Equinor to license and install automated drilling control (ADC) systems on four high-specification, harsh-environment rigs currently on contract in Norway and a fifth semisubmersible that is expected to start operations in the Norwegian Sea this summer.

In 2017, the semisub Transocean Enabler was equipped with the ADC system and, the company said, has delivered tangible improvements in overall drilling efficiency that have led to more cost-effective wells for Equinor. Further, the system has demonstrated improvements in well integrity, while enhancing safety and operations assurance.

The upgraded floaters will include the Transocean Spitsbergen, Transocean Norge, Transocean Encourage, Transocean Equinox, and Transocean Endurance.

The ADC systems are developed through the combination of various technologies from MHWirth, NOV, and Sekal AS, which enable, among other things, higher rates of penetration while drilling, highly stable bottomhole pressures avoiding swab/surge effects and early detection of kick/loss events.
TEKMAR CABLE PROTECTION SYSTEM SELECTED FOR NORTHWESTER 2
Tekmar Energy says that the offshore installation contractor Jan De Nul Group has selected the Tekmar Cable Protection System (CPS) TekLink Mechanical Latch for the Northwester 2 offshore wind farm.

Northwester 2 will be the sixth windfarm in the North Sea off the Belgian coast, consisting of 23 turbines and will provide a total of 219 MW from its location off the coast of Zeebrugge, in water depth of approximately 40 m (131 ft). The project is set for completion in 2020.

Russell Edmondson, Managing Director of Tekmar Energy said: “We are delighted for Tekmar to be selected as the cable protection system supplier for Northwester 2. This continues Tekmar’s trusted relationship with Jan De Nul Group and furthers our position as the world market leader in offshore wind cable protection systems; marking Tekmar’s 66th project within the industry, taking the total number of systems over 6,700 and 22GW of protected subsea electrical infrastructure worldwide.”

The award also continues the success of Tekmar in the region, after being selected for several adjacent windfarms including Belwind, Belwind demonstration, Thornton Bank 2 and 3 and Borselle 1, 2, 3, and 4.

Stan Logghe, Senior Project Manager at Jan De Nul Group said: “Cable protection systems are vital for protecting the electrical infrastructure of offshore wind farm projects. We have worked with Tekmar for many years, on projects including Burbo Bank and Race Bank, and Northwester 2 builds on our strong and trusted relationship.”

As part of the project, Tekmar will supply its latest TekLink Generation 8 cable protection system for all inter array and export cables.

AgileTek Engineering, a Tekmar Group company, also supported the project using its proprietary AEL cloud system, providing verification of the cable protection system design via global analysis of the cables and CPS on the project.

The product will be produced within Tekmar’s manufacturing facility in northeast England during 2019.

ENERGY PRODUCERS JOIN FORCES TO BID FOR DUNKIRK OFFSHORE WIND FARM
Total, Ørsted, a renewable major, and Elicio, a renewable energy producer preselected by the French Energy Regulatory Commission, have created an industrial consortium to submit a joint bid for the Dunkirk offshore wind farm project for a power capacity of up to 600 MW.

Philippe Sauquet, President Gas, Renewables and Power at Total said: “Total’s participation in this offshore wind bid is in line with our strategy to develop low-carbon electricity business in Europe. Our recognized offshore oil and gas know-how combined with Ørsted market-leading expertise across the offshore wind energy value chain, as well as that of Elicio, an experienced developer qualified from the beginning of the bid, provide a solid foundation for success of a safe and competitive project.”

Martin Neubert, CEO of Ørsted Offshore, said: “Offshore wind can contribute significantly to France’s renewable energy targets. As the world-leading offshore wind developer, we bring an unparalleled track-record in developing, constructing and operating offshore wind farms to the consortium, and the combined competencies of Ørsted, Total, and Elicio are ideal to help France unleash its significant potential for developing clean power from offshore wind.”

Emile Dumont, President of Elicio France, said: “Wind energy has significant growth potential in France and is at the heart of Elicio’s strategy to contribute towards a cleaner and cost-effective energy powered world. Further to Elicio’s successful preselection for the French round 3 competitive dialogue and by joining our unique expertise and experience, we are committed, with our partners Total and Ørsted, to making this tender a milestone in the French offshore wind sector.”

SEAOWLS, ULSTEIN GO THEIR OWN WAYS IN HEAVY LIFT JACKUP VESSEL MARKET
Rotterdam-based companies SeaOwls and Ulstein Design & Solutions have decided to each go their own separate ways in the offshore wind industry. The patent rights of the SOUL concept were developed under the cooperation of both companies and will continue to be held by both SeaOwls and Ulstein. Each company will pursue its own business opportunities based on the shared patent.

The heavy lift jackup vessel design concept is said to be the safest and most efficient solution to transport and install the world’s largest and powerful offshore wind turbines in the coming decades. SeaOwls and Ulstein say they are committed to assist their clients to build the most suitable jackup vessel to enable the industry to take the next step to a sustainable world.
Challenges remain for seismic survey vessel market

Ranks of active contractors have declined significantly

WHILE MUCH of the offshore industry is slowly rebounding from the downturn, the seismic vessel survey market continues to be challenging for those contractors that still remain active.

And that list has become much smaller in the past few years. Companies that have exited the market include CGG, Fugro, and WesternGeco. Companies that have filed for bankruptcy include Dolphin Geophysical, Global Geophysical Services, Geokinetics, and REFLECT Geophysical.

During the past few years, much of the existing seismic survey fleet has changed hands. One such deal was concluded last November, when Shearwater GeoServices completed its acquisition of the marine seismic acquisition assets and operations of WesternGeco, the geophysical services product line of Schlumberger. With the completion of the deal, Shearwater officials observed that the transaction makes Shearwater a global provider of marine geophysical services, which owns and operates a fleet of 14 fully equipped seismic vessels offering a full range of acquisition services including 3D, 4D and ocean bottom seismic.

To be sure, there are a number of companies that remain active in the market. They include SeaBird Exploration, Polarcus, PGS, EMGS, and others.

SeaBird recently announced the extension of two existing contracts. The contract for the Voyager Explorer, which is working on an ocean bottom node survey in the Far East, was extended by approximately 90 days until March 2019, with an option for the charterers to extend by another 30 days.

The Osprey Explorer is also working on an ocean bottom node survey in the Americas region. This contract has been extended from initially 60 days to currently approximately 180 days. Following the completion of this contract expected in early March
SEISMIC VESSEL MARKET UPDATE

PGS reports that Phase 4 of the multi-sensor Sabah multi-client 3D is underway with the Ramform Hyperion. PGS says that Sabah is one of the largest multi-client projects worldwide and the first ever in Malaysia. The company says that it will acquire up to 10,000 sq km of GeoStreamer data, adding to the existing 37,000 sq km multi-phased Sabah MC3D, which PGS says is already one of the world's largest multi-client acquisition projects.

EMGS reports that its Atlantic Guardian vessel has completed an $8-million seismic survey offshore South America. The company says it expects to operate two acquisition vessels globally in 2019 and plans to continue investing in its multi-client library in select areas. However, its capital investment plans are limited to maintenance of existing equipment.

2019, SeaBird says that the Osprey will immediately commence on a previously announced ocean bottom node survey in the same region with expected completion in mid-April 2019.

Polarcus says that it is currently acquiring an ultra-wide 3D marine seismic project offshore Myanmar. The Polarcus Amani is towing an in-sea configuration that measures 1.8 km wide across the front ends. With each of the 10 streamers separated by 200 m, the total area covered by the spread is 17.6 sq km. Polarcus says that this is the largest in-sea configuration ever towed by a single seismic vessel, as well as the largest man-made moving object on earth.

PGS’s Ramform Tethys, first launched March 2016, has been working offshore Brazil.

The Polarcus Amani is currently acquiring an ultra-wide 3D marine seismic project offshore Myanmar.
**Seismic Vessel Market Update**

As well, while more front-end engineering and design work is being awarded, new orders on larger, greenfield projects that will be sanctioned in 2019 will not help build contract backlogs until 2021. While the (now smaller) seismic survey vessel market may be poised for a recovery, there are still a number of survey vessels still stacked at quayside. These vessels will likely not be hired for at least another year, analysts predict – or not until oil companies begin maturing remote acreage.

The companies that participated in *Offshore*’s 2019 seismic vessel survey, and their latest data, can be seen below.

**Multi-Client Surveys**

Meanwhile, the industry continues to make use of data obtained from multi-client surveys to plan new exploration and drilling campaigns.

**Offshore Worldwide Seismic Vessel Survey**

*only includes companies that responded to survey

<table>
<thead>
<tr>
<th>Vessel name</th>
<th>Year rigged or converted</th>
<th>Total length (meters)</th>
<th>Total beam (meters)</th>
<th>Streamer configuration (# streamers x # channels)</th>
<th>Vessel Availability</th>
<th>Primary Region</th>
<th>Source array configuration as rigged (# arrays x capacity in cu in)</th>
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Spectrum, in cooperation with BGP, has started a 20,000-km (12,427-mi) 2D survey in the Colorado and Salado basin offshore Argentina. This new program ties with the company’s existing 38,000-km (23,612-mi) survey that was acquired in 2017 for the ongoing first offshore licensing round.

The BGP Pioneer is conducting the survey. Data is being acquired with a 12-km (7.5-mi) streamer with continuous recording to image deep reflection and high fold data. This will support full interpretation from Moho to water bottom. The data will be processed with PSTM, PSDM, and Broadband products. First deliveries are expected in 2Q 2019.

Shearwater GeoServices says it has been awarded a major exploration survey in Brazil by TGS. The project will be executed by the Amazon Warrior using proprietary Q technology starting in Q1 2019. The companies report that the Amazon Warrior will be employing

Meanwhile, the industry continues to make use of data obtained from multi-client surveys to plan new exploration and drilling campaigns.

**Multi-Client Surveys**

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CNOOC HAS SANCTIONED the first commercial run of a new umbilical manufacturing method for a subsea tieback project in the South China Sea. Aker Solutions’ Oscilay machine will produce the static sections of the Liuhua 16-2 power umbilicals, part of a package of more than 115 km (71.5 mi) of dynamic and static power umbilicals the company is supplying that will connect wells at the deepwater Liuhua 16-2, 20-2 and 21-2 gas-condensate fields to a new FPSO. Aker Solutions is currently constructing a new building to house the Oscilay closing line.

The new process has been designed to address the challenges presented by extreme tension loads on umbilicals during installation, said Greg Ross, the company’s VP Subsea Sales in Asia Pacific at the time of the contract award last summer. Its main benefit is that it eliminates the need for splicing of cables due to manufacturing weight and volume constraints. This is said to enable faster production of large diameter heavy power umbilicals, with positive consequences for offshore project schedules. An Aker Solutions team in Malaysia is leading engineering for the Liuhua project, with the team in Mobile, Alabama, responsible for all production. Final delivery is scheduled for 2020.

Power umbilicals are a critical component of the so-called subsea factory, distributing power from platforms to seabed pumping and production systems in locations often remote from infrastructure. As a paper delivered by Aker Solutions at OTC 2017* pointed out, the design challenges are greater than those of electrohydraulic umbilicals, typically related to heat transfer,
corrosion, induced current and splicing. Power umbilicals require much larger-diameter power cables restricting the length and volume that will fit on pay-off reels, which means that each time a reel has to be changed out, splices must be performed. These can often take a week to complete.

Until now, the industry has mainly used vertical or horizontal planetary bundling machines for umbilical manufacture. With the vertical system the elements are placed on a turntable and are twisted together, as they are drawn upwards, to form a cable. For each ‘closing’, a central element or bundle is pulled through the center of the turntable, allowing new elements to be added. Horizontal cabling machines employ large wheels instead of turntables to carry the machine reels, but otherwise the assembly process is similar to the vertical approach.

SZ STRANDING

Oscilay is an adaptation of SZ stranding as an alternative closing method. SZ stranding, which has long been applied for bundling smaller cables, involves rotating the tooling that bundles the various elements together. Rotating the tooling back and forth equally for each pattern prevents twist building up between the tooling, element pay-off reels and the take-up reel. The main benefits are that the machine reels are stationary (which is said to make the machinery less costly than planetary systems with a similar capacity), and the fact that the pay-off reels can be sized without volume or weight limitations.

However, power umbilicals are subject to high tensile loads, and applying a high tension to a standard SZ cable would cause it to untwist or straighten out. This action is induced mainly by the torque of the internal SZ stranded elements. Aker Solutions decided to investigate whether it might be possible to modify SZ stranding for long umbilicals. The company’s typical, planetary umbilicals are bundled in one continuous direction with a low lay angle. The elements are bundled into separate holes within the structure, each larger than the element they support in order to facilitate spooling of the umbilical. During bundling, the internal helix elements are given 100% back twist to limit the torque generated by the elements. But the large planetary bundling machines that are needed to rotate the individual element reels also have weight limitations of roughly 25-35 tons for each position in the planetary. The process of closing can therefore be run continuously only for a length corresponding to the same weight or volume range for a single element. Mindful of this limitation and the associated need for more welding and splicing, the team sought to develop and qualify an alternative bundling process that would eliminate the weight and volume constraints. In addition, there are 21 positions in the planetary bundling machine for elements, whereas the Oscilay machine contains theoretically an unlimited number of element positions. That eliminates the need for multiple passes through the closing machine for umbilicals with more than 21 elements.

According to Ruth Pleasant, Senior Engineer and Product Specialist for Oscilay: “The initial ideas for Oscilay started in 2006 when Aker Solutions realized that there was an increasing market for power umbilicals with large power cores. This was due to
the growing need for subsea pumping and also the future market for offshore floating wind power. We realized that our bundling machines in Moss, Norway and Mobile, Alabama were not suitable for the high weight and big volumes of the larger power cores being bundled into the umbilicals.

“As shorter-length power cores were needed to suit the weight and volume capacity of a standard planetary machine, our team came up with a new idea which eliminated the weight and volume limitations. This would involve manufacturing a helical bundled umbilical but in an ever-changing direction of the bundling operation, dispensing with the need for planetary action. All elements to be bundled could stay on the ground. The idea was also based on the principle that all axial force should be taken by the internal laid members, even if they were in an alternating helix configuration. We could couple the outer jacket and the internal PVC elements in rotation to balance for the torque generated by the internal elements.

“Aker Solutions holds several patents on this idea, the first being filed in 2007. To prove the concept, the first prototype, which was 70 m [229 ft] long, was assembled by hand in 2007 at the Moss plant. During 2007-2009 several more prototypes were made and compared with analysis to further prove and refine the concept. It became clear that the USAP software, developed by Marintek Norway and applied for the stress analysis, needed further development to properly handle the behavior of the alternating helix configuration. The design and engineering was a team effort between our engineering groups in Fornebu (near Oslo), Moss, and Mobile. They worked together very closely throughout the design, manufacturing and testing of the prototype umbilicals, with the majority of the prototype tests being conducted in Mobile. The Alternating Helix Phase 2 project and the large power umbilical prototype project were executed primarily in Mobile.”

The main driver for the development has been the pressing need to reduce the time taken to make long-length power umbilicals. “Medium-voltage cable splicing takes several days and is quite complex,” Pleasant explained. “This has to be strong, water resistant, electrically sound, and, critically, it needs to have approximately the same diameter as the original cable. Considering that medium-voltage cables usually come in triads, the process could easily last four or five days. If you have to do this every few kilometers, making a 100-km [62-mi] power cable might take most of the year. The opportunity cost of manufacturing something so slowly is prohibitive.

“In order to produce power umbilicals at a pace that would support the market’s needs, Aker Solutions developed what was first known as the Alternating Helix process, later renamed Oscilay. As a nice set of side-effects, the Oscilay process reduces the material handling and requires much lighter machinery.”

**LAY PATTERN**

The process follows conventional mono-directional helix stranding principles except for its lay pattern. After a couple of pitch lengths, the direction of closing changes, and the constant switch of lay-direction means there is no need for the individual elements’ pay-off reels to be placed in a planetary or on a turn table.

All elements are run into a static closing point and then twisted back and forth. As the umbilical exits the twist head it is taped to maintain the global configuration. The resultant product is then extruded to lock in the umbilical pattern. With this process, there are none of the weight and volume constraints of conventional planetary bundling machines, the company claims.

Among the main beneficiaries are long-length power umbilicals with larger power cores that traditionally reach weight/volume constraints after only 3-4 km (1.8-2.5 mi) of construction.
This forces the bundling process to be halted to allow for re-loading and splicing of power cores. With the SZ stranding principle, however, all splicing can be conducted prior to initiating closing, and with more pay-off reels being placed on the ground, the umbilical can always be closed in a single operation.

Aker Solutions decided to evaluate the proposed new process via a series of prototype tests in accordance with recommended DNV practice on qualification of new technology (RP-203, July 2010). The umbilicals used for the qualification would employ the same long lay length and PVC design as the company’s planetary design and would need to withstand the same installation and operation loads. The next steps would be to determine what was new about the technology and what was field proven, and to assess the key areas of focus during the qualification program using failure modes effects analysis (FMEA). To support the development, the company invited offshore operators, installation contractors, and engineering groups to suggest potential failure modes for the umbilical manufacturing, installation and
operational phases, many of which would be addressed during the testing phase.

In addition, it resolved to conduct standard tests in accordance with API 17E:2010 in order to compare the SZ stranded umbilical with a standard planetary umbilical. The aim was to draw up an envelope for making steel tube and power umbilicals without the need for extensive, project-specific tests. For the critical tensile testing the company opted for a steel tube umbilical cross-section that would have required two passes through the cabling machine, thereby ensuring smaller umbilicals would easily comply with the highest-risk failure modes identified by the FMEA.

Three different prototypes were manufactured with much of the testing completed prior to spring 2017. The main considerations that influenced the testing program included unpredictable behavior during spooling and reeling due to the new lay pattern; load sharing among elements toward the center of the cross-sections vs those elements toward the outer periphery; filling of the grooves in the PVC profiles and the subsequent effect on the umbilical when subjected to high tensile loads; whether the machine would have the capacity to twist an umbilical incorporating 15-ksi steel tubes; and whether the process would suit umbilical-grade flying leads. The trials conducted included handling, spooling, reeling, tensile testing, bending stiffness testing, bend under tension testing, crush testing, and flex fatigue testing.

According to David Hickman, Product Manager, Umbilicals at Aker Solutions, “one of the prototypes was a 171-mm OD steel tube umbilical (STU) sample containing twelve ¾-in. 15-ksi lines, four ¼-in. 15-ksi lines, three 10-sq mm [0.01-sq in.] quads and three 16 SMF fiber optic cables. A total of 600 m [1,968 ft] was produced. Another was an umbilical-grade flying lead (UFL) sample containing ten ½-in. 10-ksi lines. In total 250 m [820 ft] was produced. Both the STU sample and the UFL were tested according to ISO-standard requirements. These two projects were designed to be very close to previously executed planetary umbilical projects so that the results of testing and analysis could be compared.”

The third prototype was a complex power umbilical manufactured and tested to suit the requirements of a major oil company. It included three 630-sq mm (0.97-sq in.) 36kV cables, 16 SMF fiber optic cables, fiber optic sensors, steel rods, and carbon fiber rods. A total of 1,000 m (3,281 ft) was manufactured. “In order to better understand the technology’s capabilities, many hand samples were also made prior to producing these umbilicals with the Oscilay machine,” Hickman added.

Results from the qualification program suggested that Oscilay stranding would perform well, even in deepwater, and that the technique could withstand the same tensile, compression and internal pressure loads as a planetary umbilical. “The samples tested exhibited improved fatigue capacity and high torsional stability,” Hickman said, “but the same applies to all Aker Solutions umbilicals. Since each element is placed in its own conduit, element friction forces are lower than with our competitors’ products, and the reduced friction stress lowers the fatigue damage on large power cores.

“The overall mechanical properties for an Oscilay umbilical, such as tensile capacities and minimum bending radii, are the same as for planetary umbilicals that the company has delivered since 1994. The main benefit to our clients is that this technology requires fewer splices, which means reduced risk. Also, we can deliver faster since splicing is very time and labor-intensive.

“We are now purchasing larger reels for projects to make full use of the Oscilay technology. This will allow us to make the full lengths with no splices. Case studies, tenders, and active projects show a reduction in cost of over 5% while also eliminating the cable splices.”

First Oscilay production is due to start in 3Q 2019, although the new building and equipment will be ready by mid-year. “This manufacturing line will greatly increase the capacity of the Mobile facility,” Hickman said. “Since the Oscilay machine is small, easily moved and very simple, a basic building design is required. The first umbilical to be produced using the new process will contain medium-voltage cables and will be an Aker Solutions standard PVC design. There are no planned splices during closing since the project is taking full advantage of Oscilay’s benefits.”

REFERENCE

Gabon offers wide-ranging blocks, improved terms in latest license round

New data highlights pre/post-salt oil potential

GABON HAS OPENED its 12th Offshore Licensing Round, tabling 35 blocks for exploration and production in relatively shallow to ultra-deepwater. All were covered by recent 3D and 2D seismic surveys acquired by four geophysical contractors and processed using modern techniques. These have delivered a clearer picture of the long-suspected potential across the country’s multiple sub-salt and post-salt plays.

Officials from Gabon’s Direction Génerale des Hydrocarbures (DGH) and representatives of the four contractors outlined the new fiscal terms and exploration opportunities at a presentation in London earlier this year organized by Spectrum. This was one of eight roadshows to promote the round following its initial announcement in Cape Town last year. Others will be staged over the coming months at exhibitions and conferences in Beijing, Equatorial Guinea, Moscow, Calgary, and Brazil. Following requests from the industry, the ministry has extended the deadline for license applications to Sept. 30, 2019.

Edgard Mbina-Kombila, Deputy General Manager at the DGH, said Gabon’s government had validated a new Hydrocarbons Code and that ratification was now in progress: “Gabon has over 60 years history of oil production. Now it’s declining, but we think we can improve the production profile because there are still non-explored areas, especially over the deep offshore.” New discoveries should be relatively straightforward to develop, he suggested, with a long-established network of refineries and terminals in place, along with an extensive offshore and onshore pipeline system, “so there is no need for companies to put in new infrastructure.”

The 2D and 3D datasets acquired by CGG, ION Geophysical, PGS, and Spectrum under partnership arrangements with the DGH are all available under the new round. The more data companies license ahead of submitting a bid the stronger their work program will be rated, Mbina-Kombila said, with consequent reductions in future seismic commitments if the bid is successful.

Herve Bertrand N’Nang Engue, Senior Economist at the DGH,
said the new Hydrocarbons Code was based on input from the Gabonese Tax and Customs and Environment departments, the country’s upstream and downstream unions, OPEC, the University of Houston, and the African producers’ association APPA. The code is adapted to take into account oil price fluctuations, with flexibility applied to different plays and field sizes. Other positive changes include the removal of corporate income tax, a lower royalty rate on deep/ultra-deepwater production, and higher cost recovery rates of up to 70% for conventional oil, and in deep/ultra-deepwater, 80% for oil and 90% for gas. As for license durations, the initial exploration phase has been extended from six to eight years with the oil production phase extended from 20 to a maximum of 30 years, 35 years in the case of gas.

EMERGING PLAYS

All of Gabon’s current offshore production comes from relatively near-shore fields, but there has been patchy exploration in recent years of the lesser known presalt plays. This has delivered deepwater successes such as Total’s Diaman-1B gas-condensate discovery in the Diaba block in 2013 and Shell’s Leopard (gas) the following year in the BCD license, 145 km (90 mi) offshore and in 2,110 m (6,922 ft) water depth. Two other consortia achieved deepwater oil successes last year with the Ivela-1 and Boudji-1 wells.

According to a report drawn up by Spectrum for the ministry for the 12th Round, exploration to date off the north of Gabon has focused on shallow oil-post-salt plays in shallow water. The resulting oil discoveries prove the presence of a post-salt hydrocarbon system. In the presalt, there have been a few nearshore gas discoveries but the presalt oil plays have been ignored due in part to imaging restrictions. That situation has changed with advances in imaging and drilling technologies; recent assessments suggest that the deeper presalt synrift close to the shore contains structural plays with quality reservoirs above oil-prone source kichens. And farther to the west the post-salt is so thick the likelihood is that source rocks here will also be oil-generative.

Offshore central Gabon, the new license blocks offered are over the outer part of the Ogooue Delta, where water depths were beyond the capabilities of earlier exploration. There appear to be various undrilled structures in the post-salt close to the oil-prolific shallow-water area. New technologies are allowing stratigraphic targets to be imaged over potential sandstone channel, slope and fan plays over underlying salt diapirs. And analysis of post-salt carbonates indicates that the syn-rift is potentially generating billions of barrels of oil, or where it is really thick, gas-condensate, said Spectrum’s Neil Hodgson. Sub-salt plays in the Ogooue Delta have been virtually unexplored.

Off southern Gabon, in addition to the proven Gamba sandstone post-rift, presalt plays, modern imaging is for the first time revealing large, syn-rift anticlines, and the few wells drilled to test this play have been successful.

DATA REVIEWS

CGG’s focus has been on Gabon’s South basin. Working with the Ministère du Pétrole, Gaz et des Hydrocarbures, the company acquired over 25,000 sq km (9,652 sq mi) of 3D seismic over an area that includes some of the 12th Round blocks, using its BroadSeis broadband technique, full-waveform inversion and tomographic velocity modeling to image prospective structures at base salt level. The survey area is also close to and downdip of pre-Aptian salt discoveries.
such as Ruche and Tortue in the Dussafu block (now under development by BW Offshore) and Diaman, and both Ivela and Boudji were identified based on this data-set, CGG claims.

Over 2,500 sq km (965 sq mi) were overshot by perpendicular 14-km (8.7-mi) long-offset data in order to provide dual-azimuth coverage, with over 3,800 sq km (1,467 sq mi) acquired applying similar offsets for improved imaging of deeper diving waves. According to the company, the main prospective targets are in deep sub-salt Barremian to Aptian sandstones; supra-salt Albian Madiela carbonate turtlebacks; and Cretaceous-Tertiary turbidite sands that have proven to be fertile hunting ground to the south offshore Congo and Angola.

Results from the BroadSeis data-set are also incorporated in volume 2 of the CCG/Robertson JumpStart integrated geological study of the South basin.

More recently CGG has been acquiring 9,800 km (6,089 mi) of long-offset, broadband 2D data to help define the full extent of existing and newly identified plays in the basin and to assist understanding of the thickness variations in the sediment overburden for source rock and maturity analysis. Broadband processing should improve characterization of the turbidite systems that represent potential exploration targets, while the low frequencies should provide sufficient penetration to enhance understanding of the nature of the deep crust, the company says.

ION, working with the ministry and the DGH, has acquired five 2D surveys over the past few years across Gabon’s entire offshore area, with all the data re-processed, re-imaged and integrated last year into the new 2D BasinSPAN data-set. This covers 4,760 km (2,958 mi) off northern Gabon and 6,000 km (3,728 mi) off the south of the country. ION’s Ken McDermott, speaking at the London event, said the new seismic lines over the north show good reflectivity from the salt down to the base of the crust, revealing what appear to be sediments curling around salt diapirs.

The SPAN data is said to support development of a full crustal deformation model for the offshore area and provides input to assist source rock maturation modeling. Line orientations have been designed to improve understanding of the initial and subsequent break-up and transform margin phases that impacted the area during the opening of the South Atlantic. ION claims the program has helped resolve issues related to hydrocarbon expulsion and timing and the thickness of Cretaceous units critical to the development of new hydrocarbon concepts.

PGS’ Gabon MegaSurvey, another initiative developed with the DGH over the past 10 years, provides over 35,000 sq km (13,513 sq mi) of merged 3D/2D data and regional interpretation over mature and frontier offshore areas, with key horizons calibrated to released well data allowing users to focus on detailed prospect-level interpretation.

Spectrum’s most recent efforts offshore Gabon have involved reprocessing in 2016 of a 2D data-set acquired in 2009, followed in 2017 by acquisition of 11,000 sq km (4,247 sq mi) of 3D data over the south (including the currently offered blocks) and subsequently 5,500 sq km (2,123 sq mi) of 3D seismic over the north. The company has finished processing the southern data and expected to finish work on the north this month. In addition, it has been cooperating with the DGH on reprocessing existing 3D data using modern broadband techniques, said Neil Hodgson. He pointed out that although around 18 exploratory wells had been drilled in the south on the Dentale Gamba play, only one had found oil. The poor returns appear to be down to problems with seismic definition clarity: Spectrum has applied de-ghosting during processing which will hopefully improve imaging in this region.

Area covered by CGG’s latest Gabon South basin deepwater 2D multi-client survey. (Courtesy CGG)
‘DECOMMISSIONING IS COMING OF AGE’ is a phrase heard in the UK oil and gas industry. Now it is steadily occurring alongside exploration and production on the UK continental shelf (UKCS). It is a phrase that aptly describes the sector’s expertise, accumulated over 30 years of decommissioning offshore structures in the North Sea basin. Ensuring that knowledge is shared is crucial to developing the highly skilled teams needed to deliver projects cost-effectively.

When Oil & Gas UK launched its 2018 Decommissioning Insight report in November press headlines like ‘Industry efficiency drive cuts UK bill’ highlighted how the competitive capabilities had improved project delivery. In contrast to reports published since 2010, this Decommissioning Insight revealed for the first time a 20% reduction in forecast expenditure over the next 10 years in comparison to the 2017 Insight report.

Transformational changes are taking place on the UKCS. Through relentlessly focusing on improving efficiency throughout the oil and gas lifecycle, the industry is extending the economic viability and productive life of offshore assets, attracting fresh investment into the basin. In 2018, final investment decisions for 13 new projects were approved attracting £3.3 billion ($4.2 billion) of capital investment with the potential to produce 400 MMboe over time, adding to the taxes the UK Treasury receives from the sector.

These changes push cessation of production dates and decommissioning projects into the future. They are helping to stabilize the market, with decommissioning expenditure predicted to even out at about £1.5 billion ($1.9 billion) per year.

In 2018, decommissioning represented only 8% of the oil and gas industry’s overall expenditure on the UKCS. Current trends suggest this decommissioning spend will grow slightly in the near term, possibly rising to 10%. However, market conditions including oil prices and expenditure in areas including exploration, well appraisal, and operations will influence how things might unfold in the future.

Changing UKCS dynamics offer an invaluable window of opportunity. With decommissioning scheduled to occur over a longer timeline, the country can build on existing specialist
The Work Breakdown Structure provides a standard approach to modeling decommissioning projects. (Courtesy Oil & Gas UK)

The country’s experienced supply chain has a clear opportunity to develop world-class decommissioning capabilities that can be marketed worldwide as it makes the most of the steady flow of diverse and technically challenging projects on the UKCS.

In areas of highly technical complexity like well decommissioning, the industry is already delivering projects safely and in an environmentally-sound and cost-effective manner. Over the past year, forecast decommissioning costs per well have fallen by an average of 26%. While market conditions played a role in these cost reductions, the industry’s improving efficiency is helping to deliver repetitive gains in most projects. In some individual projects, the average amount of days spent on well decommissioning have halved throughout the lifecycle of the project.

Looking ahead, 1,465 UKCS wells are forecast to be decommissioned in the next decade. Representing one-fifth of the total well stock drilled to-date in the UK North Sea, this equates to a steady stream of almost 150 wells per year on average.

These activities will happen across the UKCS with decommissioning taking place on 391 wells in the northern North Sea and west of Shetland; 475 in the southern North Sea and Irish Sea; and 599 in the central North Sea. Comprising a mixture of platform, subsea and suspended exploration and appraisal wells, they represent a sizeable quantity of projects where the UK’s supply chain can both apply and hone its expertise, in highly specialized aspects of decommissioning.

The association is setting the agenda technically including in the development of tools like the Work Breakdown Structure (WBS). Giving industry a standard approach to modeling decommissioning projects, this encompasses all elements of a typical decommissioning project. Different expertise is required within each WBS phase: from engineering practitioners at the front end to operational expertise as the installation is made safe, to lifting scopes, subsea scopes and finally re-use, recycling and disposal.

Details of the WBS are included in Oil & Gas UK’s Decommissioning Cost Estimate Guidelines. The WBS establishes a common language for all those involved in decommissioning providing the supply chain with clarity about where they fit into the spectrum, outlining good practice in contract execution to operators and defining to the regulators the cost provisions per phase.

The WBS includes aspects such as initial field economics, decommissioning security agreements toward the end of field life, planning the cessation of production and preparing decommissioning plans. The association is using this structured approach to set a global performance framework, a valuable tool for benchmarking projects.

In November 2018, the UK government acknowledged the industry’s coming of age when it issued a call for evidence on its plans to make the UK a global hub for decommissioning. As one of the most mature decommissioning markets, the UK can help set the agenda on how these activities are effectively regulated to ensure safety, environmental protection, and sustainability. The UK’s growing expertise in cost-effective decommissioning combined with a stable fiscal regime is improving the competitiveness of the supply chain. With other countries already moving to secure a share of global decommissioning work, the call for evidence presents the country with a great opportunity to focus on the highly specialized areas where the UK excels such as well decommissioning, removals and subsea infrastructure decommissioning and apply these internationally.

The Oil and Gas Authority’s (OGA) UKCS Decommissioning 2018 Cost Estimate Report highlighted the country’s growing expertise, showing the industry has already reduced costs by 7% from the 2017 estimate.

The UK government is rightly focused on cost-efficient decommissioning, a desire the industry shares and is committed to deliver in a safe and environmentally responsible manner.
manner. The industry is largely responsible for covering the cost of decommissioning, which as the 2018 Insight report shows was £1.15 billion ($1.48 billion) in 2017. These are normally occurring business costs which companies can offset against current or historic profits, taking place toward the end of the lifecycle of an asset.

Companies’ decommissioning spend provides work for supply chain companies, helps develop highly exportable specialist capabilities and in turn, generates tax receipts for the UK Treasury. While the industry receives some tax relief on its decommissioning costs, it is only a small fraction of the £330 billion ($424 billion) paid in production taxes alone to the treasury since North Sea production began.

In 2016, the OGA set the sector a target to reduce forecast costs by 35% by 2022. The regulator’s Cost Estimate report shows the progress toward this goal, much of which has been achieved through better project planning and execution.

New technology has significant potential to realize efficiencies in decommissioning project delivery. Created in 2017, the Oil & Gas Technology Centre (OGTC) in Aberdeen is an industry-led research and knowledge organization, backed by the UK and Scottish governments to fund and direct projects aimed at unlocking the full potential of the UK North Sea.

Decommissioning is one of OGTC’s focus areas and there have been great examples of industry, academia, and government collaborating to develop innovative technological solutions. Spirit Energy, well specialist Interwell, and several major North Sea operators are trialling a new well decommissioning technology that could cut millions of pounds from budgets. The new method, being trialled in an onshore well, uses termite and a controlled chemical reaction in the well rather than a traditional cement plug.

The UK’s offshore oil and gas industry is setting the agenda commercially, with companies combining their strengths to deliver broader services to operators. These innovative contracting strategies offer operators a variety of options for tendering while also enabling the participation of a greater number of supply chain companies, enhancing competition in the market.

Through developing world-leading expertise in decommissioning, the UK industry is unlocking significant potential to export this expertise to other oil provinces.

Yet, how do we build on the industry’s decommissioning achievements to date, while maximizing economic recovery from the UK North Sea?

Education and training are key in helping us build upon the advanced capabilities that exist in the UK. A growing number of initiatives are already inspiring, educating, and preparing the future decommissioning workforce, in response to the broadening awareness that decommissioning has come of age.

In 2017, the University of Aberdeen launched the world’s first MSc in Decommissioning, and Sam George of the Oil & Gas UK is one of the first students to have earned a degree in this pioneering qualification. Designed in collaboration with operators, supply chain companies and regulators, it is a positive step in ensuring experience is shared with those who wish to pursue a career in decommissioning.

Elsewhere in Aberdeen, Robert Gordon University offers a course in ‘Planning for Decommissioning’. Developed with the OGA, the UK government’s Department for Business, Energy and Industrial Strategy, and the Health and Safety Executive, this provides students with detailed insight into decommissioning legislation.

In January 2019, the National Decommissioning Centre (NDC) was launched. The author is a member of the steering committee for this new resource in Aberdeenshire, which is the result of a £38-million ($49-million) partnership between the OGTC and the University of Aberdeen. The goal of the NDC is to be the leader in research and development that transforms decommissioning and mature field management.

The UK is now well positioned to make the most of a global market of some $80 billion over the next decade. The UK oil and gas industry is focused on making the most of this unique window of opportunity.
Employing best practices underpins FPSO project success

Industry moving toward standard specifications

JEFF DICE, ENDEAVOR MANAGEMENT

THIS AUTHOR’S FIRST FPSO experience began in the mid-1990s, and the assignment offered several key lessons. That first project involved the conversion of an old tanker into an FPSO on an incredibly short schedule. Based on the commercial success of that field, the industry had an opportunity to improve risk acceptance of conversions and short schedules. More than two decades later, that field is still producing, and the FPSO industry still has opportunity for improvement.

With WTI crude prices fluctuating around $50/bbl, there continues to be a push to advance cost-effective field development options for oil-rich discoveries, and FPSOs have proven to be effective solutions in a wide range of water depths.

Effective use of FPSOs depends upon several key aspects, including strategic decisions, project delivery, re-deployment and hull design, process and module design, mooring and offloading, and operational considerations.

STRATEGIC DECISIONS
Selection of the FPSO as a development solution has become more widespread, but strategic decisions made in conjunction with FPSO concept selection impact a range of performance parameters during both project execution and the life of the field. Two of the most important strategic decisions are definition of:

• Technical specifications
• Whether to lease or to own.

After years of being driven by detailed company specifications, the offshore oil and gas industry is moving to standard industry specifications that may not yet be fully developed. The decision to own or lease an FPSO is affected by a number of factors which include access to cash, cost of financing, and control of operations with the associated risks.

PROJECT DELIVERY

Project delivery addresses three major issues associated with successful delivery of FPSO projects including:

• Project organization
• Interface management
• Change management.

FPSO projects have distinctive characteristics such as storage and offloading with strong marine industry links that are significantly different from other floating production systems, and which require specific resources and organization to properly manage and deliver successful projects. The integration of these resources into the overall project team is critical for success in terms of schedule, budget, and risk management.

Effective management of interfaces is a critical success factor for delivering any project. The effort required to do this increases exponentially with complexity. FPSOs are on the high end of the complexity spectrum due to the multiple functional requirements spread across several contractors and multiple equipment suppliers.

Change during FPSO projects is a given, and failure to accept, recognize, plan for, and respond to change can be attributed as one of the greatest contributors to adverse FPSO project performance. The impacts can be very visible and predictable or hidden and appear indirectly. Most of these factors have a negative effect on the project cost, outcome, and stakeholder relationships. The development of a robust change management system is a requirement for a successful FPSO project.

REDEPLOYMENT AND HULL DESIGN

A major early decision for the FPSO will be whether the hull is based on a converted tanker or a newbuild FPSO specific design. Conversion is dependent upon availability of a tanker of sufficient size to meet storage requirements, whereas newbuilds may be customized for the application.

Whether newbuild or conversion, a suitable FPSO hull must account for the required storage volume, cargo/ballast handling systems, topsides weight, weather at location, regulatory constraints, on-station repairs and maintenance over the full operating life, and tank/skin protective configuration.

Class can play an important role in conformance with regulatory and Flag State requirements for an FPSO. A strategy for Class or alternative means of marine assurance and marine regulatory approval must be in place as part of hull selection and design.

Because they are highly autonomous floating systems, FPSOs offer high potential for relatively simple removal and relocation compared to most other production system alternatives. As examples, the industry’s second FPSO (FPSO II, SBM) is now on its fourth location after an initial 11-year deployment and Petrojarl I (Teekay) commenced production in May 2018 on its 12th redeployment.

PROCESS AND MODULE DESIGN

The FPSO industry seems to have settled on common designs for the separation of oil, water, and gas with only a few modifications in the basic design to handle unique reservoir conditions. This leaves the design of the process system on the FPSO focused on three major areas:

• Vapor recovery
• Gas handling (and disposal)
• Water treatment/injection.

The global trend toward reducing greenhouse gas emissions has created the need for FPSO operators to develop and use methods to minimize emissions from vapor recovery, tank inerting, and gas disposition once it has been recovered.

In addition, country regulations are becoming more stringent regarding the overboard disposal of process water and reducing the acceptable levels of oil in water, as well as regulating other constituents in the produced water discharged to sea.

FPSO process module design addresses three major areas associated with the design, installation, and placement of the process system modules on the FPSO. These are:

• FPSO operability
• Crew safety
• Installation and interfaces considerations between the hull and the process modules, which need to be addressed during the design of the FPSO.

MOORING AND OFFLOADING

Once an FPSO is selected as the field development option, a key decision will be related to the selection of mooring, risers/umbilicals, and associated oil export offloading systems. Important considerations associated with this decision include the operational location, disconnect strategy, field architecture and associated turret/fluid swivel system, and type of export tankers.

OPERATIONAL CONSIDERATIONS

Most FPSO operating procedures are similar and can be applied to FPSO operation in different locations and under different jurisdictions. Developing and implementing generally acceptable standard operating procedures could achieve safer operations, considerable cost savings, greater operational efficiency, uncertainty reduction, savings in time, effort and man hours, greater ease of crewmember transfer from one FPSO to another, and would result in a reduction of operating risks – i.e. improved risk management.
NEXT STEPS

With all these opportunities for improvement, the industry seems poised to capture FPSO best practices and apply them to future projects. These best practices could lead to FPSO industry standards. Having recognized this, Endeavor Management has organized a joint industry project to seek out the best practices for FPSO projects from those with the experience to share with the industry. The goal of this JIP is to define and organize the best practices across the participant group and give the participants access to industry knowledge and thereby improve industry performance. Endeavor has developed a three-stage process that will be applied to this FPSO Best Practices JIP.

The first stage will gather JIP participant subject matter experts (SMEs) to input their practices on the topics listed here. The second stage will have Endeavor expert advisors compile and delineate the practices for all topics and present back to participant SMEs for review. The third stage will be creation of a report across all topics in a form as will be useful for future participant use. Using this kind of in-depth knowledge along with early engineering, operators can significantly improve perform FPSO project outcome. This FPSO Best Practices JIP is currently being offered to the industry.

Although the successful design and implementation of an FPSO on a project is a result of a multitude of decisions and tradeoffs for the operator, experience has proven that using lessons from past projects helps successful completion of current and future projects. Except for a few major operators and leased FPSO providers, FPSO projects do not come along very often for individual companies, and improving performance is hard to do without some history from which to learn. Hopefully, the industry can both create and apply FPSO Best Practices to create competitive projects.

THE AUTHOR

Jeff Dice, PE, PMP has 28 years of experience as project manager and structural engineer, providing field development, project management, design assurance, structural analysis and design, fabrication support, installation management, planning/scheduling, and cost estimation for FPSO and other offshore projects.
Eider bypass project extends lives of North Sea fields
Production platform converted to new service role

NORTH SEA OPERATORS are striving to extend the lives of their older facilities. TAQA’s Eider platform, installed in the late 1980s, had reached the point where running costs were too high to justify continued tail-end production from Eider and further hosting of the Otter field subsea tieback. But by re-routing Otter’s oil and converting the platform to a new utility role, the company has managed to defer full-scale decommissioning until well into the 2020s.

Shell and partner Esso discovered Eider in 1976 in block 211/16 in the UK northern North Sea, in a water depth of 158 m (518 ft). The fixed steel platform, built in Nigg, northeast Scotland, comprised an 18,670-metric ton (20,580-ton) jacket and a 5,557-metric ton (6,125-ton) integrated deck – reportedly the first ever for a North Sea oil platform – supporting derrick, drilling and accommodation modules, a flare boom and helideck totaling an overall dry topsides weight of 11,606 metric tons (12,793 tons). The original plan called for seven production and seven water injection wells, with 10 spare well slots on the jacket in case further wells needed to be drilled through the heavily faulted mid-Jurassic Brent Group reservoir.

Development also entailed extensive use of existing facilities at the partners’ nearby Cormorant and Tern field platforms. So the Eider facility was designed for separating water from the production stream (first-stage separation) with oil and gas sent to North Cormorant for processing, while injection water would be imported from Tern. Eider’s produced gas was used for power at the platform, with surplus power and gas sent to North Cormorant. North Cormorant and Eider are connected via a 33-kV subsea cable allowing power sharing between the two assets; generators on Eider and North Cormorant can generate power from process gas or diesel.

As Eider’s oil production started to decline, capacity became...
available on the platform for a subsea tie-back of the Otter oil field, 21 km (13 mi) to the northwest, which operator Total developed in the late 1990s via three oil production wells fitted with dual electric submersible pumps, with Tern providing injection water for reservoir support. During the following decade, Shell, like other major oil companies in the area, decided to downsize in the UK North Sea, and this led to Abu Dhabi National Energy Company PJSC (TAQA) assuming operatorship in 2008 of Eider, Cormorant Alpha, North Cormorant, Tern, and associated subsea fields. In 2012 the company negotiated a separate deal with Total that gave it full ownership of Otter.

Between 2009 and 2017 TAQA reactivated the Eider platform’s drilling rig, extended the accommodation, replaced the water injection and production flow-lines between Eider and Otter, and carried out obsolescence and maintenance projects on the platform to ensure continued economic and safe operation. “The facility remained essentially as it was installed with the addition of some further accommodation modules, through 2017,” said Technical Director David Gibson. “Other than maintenance and some obsolescence changes, Otter system support or utilities have also remained as they were when TAQA took over operatorship.

“During the period to 2017, the company completed well interventions and scale squeezes to maintain safe production on the Eider and Otter wells. Subsurface studies were carried out, but these did not identify further economic infill targets. On Otter, the company commissioned workovers to replace a failed electric submersible pump and dive support vessel campaigns to rectify subsea infrastructure issues and production was maintained through scale squeeze activities.”

When Eider came onstream in November 1988, estimated in-place oil, according to the field development plan (FDP), was 204 MMbbl with targeted production over the life of the field of 85 MMbbl, a recovery factor of 42%. Shell later issued an addendum to the FDP extending production to the Eider West area, where the target was 2 MMbbl from estimated reserves of 6.6 MMbbl, lifting the total anticipated recovery to 87 MMbbl. “In fact Eider’s production has been significantly better than estimated in the two FDPs,” Gibson said, “with the field delivering 118 MMbbl from the latest resource estimate of 240 MMbbl, a recovery factor of around 49%.

“However, by late 2017 the well delivery rate was at a level where production was uneconomic and the combined opex across North Cormorant, Eider, and Tern would have rendered the entire area uneconomic if we had done nothing. In addition, there were integrity issues with the water injection and production pipeline risers at Eider. By fully bypassing Eider, TAQA calculated that the integrity threat could be fully mitigated and opex reduced across the field.”

The project involved a series of measures including P&A of all 18 Eider platform wells, with removal of all conductors – completed January 2019; bypass of hydrocarbon and water injection pipelines – completed September 2018; installation of a multiphase pump at Otter – completed September 2018; and flushing and purging of hydrocarbons and make-safe modifications on Eider – scheduled to be completed in April 2019.

Gibson explained: “The Eider platform was engineered to be remotely controlled via a microwave link from North Cormorant, although Shell’s goal of sustained fully remote operation was not achieved. Under the bypass program only minor changes were necessary to the control systems so that Otter could be controlled directly from North Cormorant. Otherwise, the remote control arrangement remains basically the same as in the original design.

“There has been no need for structural strengthening on the Eider platform, and no equipment has been removed as yet. Maintenance has been significantly reduced as the platform is fully isolated from wells and pipelines. However, structural inspection will continue and any improvements to equipment performance arising from advances in digital techniques will be applied to Eider, as it would to the rest of the area.

“A very small crew remains, charged with maintaining the utility systems that provide power and utilities to Otter and power sharing for North Cormorant, enabling maintenance on that facility. We may also use Eider to demonstrate alternative removal methods and will consider any re-use opportunities for the asset.”

In the platform’s new utility mode, Otter production continues and with the latter’s recently installed multi-phase pumping system, output is now higher as the system enables concurrent production from all the field’s three oil wells. In addition,
production reliability is increased and assured as the design life of the multiphase equipment is greater than that of the existing electric submersible pumps.

"As for North Cormorant," Gibson said, "only minor changes needed to be made to existing equipment in order for the platform to receive and meter the multiphase fluids from Otter. On Tern the water injection system was modified to provide pressure protection to the Otter flowline, a task that was previously handled from Eider."

Following the changes, TAQA expects the Eider platform to remain in utility mode into the next decade and for North Cormorant to keep producing until at least 2024. However, the company is keeping its options open for the area's longer-term future. "Cessation of production [CoP] of any asset is something that is reviewed on a regular basis," Gibson explained. "Within TAQA's UK northern North Sea portfolio there remain a number of opportunities that could bring greater value and/or change the CoP date. These assets remain open to new business opportunities."

OTTER FIELD LIFE EXTENSION
The start-up in late October last year of a multi-phase pump (MPP) in the Otter field marked another milestone in TAQA's strategy of maximized economic recovery from its assets in the UK northern North Sea. This is the company's first use of MPP technology in the North Sea, and the investment not only extends the producing life of Otter, thereby helping to prolong the life of the host North Cormorant platform, but also creates a window of opportunity for the company to pursue new development prospects at North Cormorant.

Contractor OneSubsea performed design, testing, installation and commissioning of the pump within 16 months, with the total project management model fulfilling both parties' goal of improved execution efficiency. Project manager Derek Pullem commented: "It was critical for us to perform the project when we did – and within the set timescales – to maintain the viability of the overall strategy. Delivery has been closely interlinked with other strands of the strategy to help us achieve our overall production goals. If we're to make the most of our aging assets that is the kind of creative approach we'll need to take in future."

The program involved sustained support from TAQA's offshore personnel and close working links between installation contractor Subsea 7, Eider and North Cormorant during the final phases. With three Otter wells producing simultaneously, production from the Otter field has increased by around 3,000 b/d compared to levels in 2017.
Industry advances ROV and AUV technologies

New subsea robotics maximize uptime

JESSICA STUMP, ASSISTANT EDITOR

AS THE OFFSHORE oil and gas industry recovers, demand for remotely operated vehicles (ROV) autonomous underwater vehicles (AUV) increases.

Global utilization of the available ROV fleet fell to 32% in 2017, according to Westwood’s latest World ROV Operations Market Forecast. However, demand for both traditional oil and gas applications and new offshore support roles will assist a recovery in ROV demand between 2019 and 2023. The analyst expects that with upcoming attrition in the fleet and an improved demand outlook, utilization could return to 50% by 2023.

As operators continue to move into deeper waters, Westwood anticipates a notable uptake in AUV utilization for oil and gas operations. More offshore operators look set to deploy AUVs for life of field inspection programs, according to the analyst’s World AUV Market Forecast 2018-2022. The benefits of using AUVs for field inspection go beyond cost savings, said Westwood analyst Ian McDonald. They can increase operational safety, lessen the environmental impact of inspection operations, and reduce the number of personnel needed at sea.

As operators look to sustain capital discipline, ROV and AUV manufacturers are responding with new systems that maximize uptime.

Houston Mechatronics has introduced Aquanaut, a multi-purpose subsea robot which employs a patented shape-shifting transformation from an AUV to an ROV. The vehicle, which removes the need for vessels and tethers, is said to enable both the efficient collection of data over long distances as well as manipulation of subsea objects at a lower cost than today’s technology. As an AUV, the Aquanaut can cover up to 200 km (108 nautical mi) in one mission and features vertical thrust control and an articulating bow. The company said it transforms into an ROV with four in-house designed linear actuators. The hull separates in one fluid motion, exposing two more control thrusters.
<table>
<thead>
<tr>
<th>Location</th>
<th>Caspian Sea</th>
<th>Gulf of Mexico</th>
<th>Norwegian Sea</th>
<th>Brazil</th>
<th>Gulf of Mexico</th>
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</thead>
<tbody>
<tr>
<td>Field</td>
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<td>Perdido</td>
<td>Gullfaks</td>
<td>Otter</td>
<td>Lagaugan</td>
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<tr>
<td>Supplier</td>
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<td>Schlumberger</td>
<td>Baker Hughes</td>
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<td>Technology</td>
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<td>Booster Pump</td>
<td>ESP</td>
<td>Jet</td>
<td>Mini Pump</td>
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<td>Description</td>
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<td>Centrifugal</td>
<td>Turbo</td>
<td>Turbo</td>
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<tr>
<td>Notes</td>
<td></td>
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</tr>
</tbody>
</table>

**Technology Key**
- **ESP**: Electric Submersible Pump
- **Jet**: Jet Pump
- **Jet/Orgain**: Jet/Orgain Pump
- **SPP**: Subsea Pumping System
- **SS**: Subsea System
- **Cable**: Electrical Cable
- **Pipe**: Subsea Pipe

**Notes**
- When selecting subsea technology, consider factors such as field size, fluid type, and operational conditions.
- Always ensure compliance with industry standards and regulations.
- Collaboration is key in realizing successful subsea projects.
### TABLE 3 – ACRONYMS & SRSWI

<table>
<thead>
<tr>
<th>ACRONYM</th>
<th>DESCRIPTION</th>
</tr>
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<tbody>
<tr>
<td>MAN</td>
<td>MAN Energy Solutions (1)</td>
</tr>
<tr>
<td>Subsea Transformer</td>
<td>Transformer for subsea separation and injection system</td>
</tr>
<tr>
<td>Mega Watts</td>
<td>Electric power output</td>
</tr>
<tr>
<td>GVF</td>
<td>Gas Volume Fraction</td>
</tr>
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<td>ABB</td>
<td>ABB company</td>
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<td>GE</td>
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<td>Siemens company</td>
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<td>Baker Hughes company</td>
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<tr>
<td>Halliburton</td>
<td>Halliburton company</td>
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<tr>
<td>GE / OneSubsea</td>
<td>Joint venture between GE and OneSubsea</td>
</tr>
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<td>Aker Solutions company</td>
</tr>
<tr>
<td>Petrosys</td>
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</tr>
<tr>
<td>Leistritz Turbomachinery solutions</td>
<td>Turbomachinery solutions by Leistritz</td>
</tr>
<tr>
<td>ASOS</td>
<td>Aker Solutions company</td>
</tr>
</tbody>
</table>

### Increase production. Now.

TechnipFMC delivers subsea boosting solutions that improve return on investment, achieve recovery faster and enhance production that is reliable, sustainable and economical through the life of the field.

TechnipFMC.com
SEAMOR Marine Ltd. has unveiled Mako, a heavy payload ROV named after a shark. The Mako ROV can carry 14 kg (30 lb) as a standard build and is upgradeable to 22.5 kg (50 lb). This higher carrying capacity permits larger instrumentation (such as multi-beam imaging sonars) to be integrated. The new ROV can fly at 2 knots thanks to eight thrusters. Four vertical thrusters and four horizontal thrusters provide stability and maximized forward thrust. It also features a large accessory bay with an open, modular design. This design choice, the company said, provides ample space to mount and position accessories. The ROV has plenty of power to operate multiple accessories at once. A standard Mako measures 840 mm x 635 mm x 674 mm (33 in. x 25 in. x 27 in.) and weighs approximately 72 kg (160 lb).

Forum Energy Technologies has developed a range of electric ROVs. The XLe, designed and manufactured at the company’s Kirkbymoorside complex in northern England, is the first and smallest of the new range. However, it is sufficiently powerful to undertake subsea maintenance and repairs using its optional electric or hydraulic five-function manipulator arm.

According to the company, the vehicle’s self-regulating power feature compensates for tether losses, ensuring a constant and stable power delivery to the vehicle regardless of the length of the tether.

It employs the same Forum Integrated Control Engine (ICE++) that is featured in the company’s larger work-class and trencher vehicles. This is said to provide a range of auto-pilot and pilot assist modes when appropriate sensors are fitted.

Its latest electric ROV is the XLe Spirit. This is the first observation-class ROV to use Forum’s integrated control engine to bring greater functionality commonly only found in larger work-class vehicles. The ROV is said to incorporate several features to maximize its stability for use as a sensor platform, including regulated propulsion power, optimized thruster orientation and location, accurate thruster speed control and a wide range of auto-functions for positioning and flying.

Last year the ROV completed a 12-week test program at the company’s test tank in Kirkbymoorside, Yorkshire. Sea trials are expected to start in 1Q 2019.

A control electronics pod fitted to all XLe observation class vehicles, the company claims, enables superior connectivity and expansion capabilities. Ethernet interfacing allows for seamless integration with other industry sensors using common IP architecture and ease of remote data transfer.

Ocean engineering has produced the E-ROV, a self-contained, battery-powered ROV system. Comprising an electric ROV, 4G connection buoy, and subsea cage, the system can operate for extended periods of time without being recovered to the surface, which reduces cost and risk.

Subsea 7 subsidiary i-Tech Services has extended its underwater inspection and maintenance service to include new mini ROVs for performing smaller scopes of subsea work. These are said to be quick to deploy and easily transported to the offshore location by helicopter or aircraft. The mini ROVs are said to offer high maneuverability and a power-to-weight ratio that allows them to carry small tools and manipulators that can be operated in strong currents. They can also be mobilized rapidly and manually from any platform, FPSO, barge or vessel of opportunity.
Saudi Aramco has inaugurated a torpedo-shaped AUV. The AUV is designed to perform surveys to identify seabed clearance and potential debris around offshore platforms. It can also conduct offshore pipeline inspections to determine subsea asset integrity and locate potential leaks. According to Aramco, the vehicle, which cost $2.5 million to construct, can handle duties formerly undertaken by a $50-million, large survey vessel.

In addition, the AUV’s modular design allows for interchangeable modifications based on the mission’s needs. For example, the sidescan sonar/bathymetric module for geophysical operations can serve as a camera for subsea inspection projects, and as the environmental module for oil leak detection surveys.

An additional battery module can be added to the assembly, allowing the AUV to extend the length of its mission.

Aramco claims the AUV resembles a shrunken vessel, operable remotely from shore or from a boat controlling the vehicle through Wi-Fi when within reach of its connection limit. When at the required depth, the vehicle travels along its mission’s route by means of its Inertial Navigation System.

**RESEARCH AND DEVELOPMENT**

Collaboration is playing a key role in helping the industry develop technologies and solutions to increase autonomy and remote residency of the subsea systems.

Shell has awarded Saipem a license to develop technology for FlatFish, a resident subsea autonomous vehicle designed to perform subsea asset inspections. This should be qualified for commercial application by 2020.

FlatFish is a Brazilian project previously developed over a four-year period by SENAI CIMATEC in partnership with DFKI, with funding from the ANP R&D program and EMBRAPII.

Saipem plans to add capabilities for riser inspection, data harvesting from subsea sensors, contactless monitoring of cathodic protection systems, and a ‘flying-hanging garage’ for launch/recovery and subsea recharging/reprogramming of the FlatFish from offshore platforms. These enhancements will be supported by SENAI CIMATEC which, along with Saipem do Brasil, entered the development arrangement with Shell Brasil last December.

Ocean Power Technologies Inc. (OPT) and Saab Seeye Ltd. have signed a non-exclusive agreement to pursue mutual opportunities through joint system solution development and marketing. The agreement anticipates a preliminary focus on AUV and ROV charging and communications systems.

OPT President and CEO George Kirby said: “We believe OPT’s PB3 PowerBuoy, coupled with Saab’s technologies, creates the premier unmanned system, providing remote charging capabilities for both autonomous and remotely operated vehicles. We believe the combined OPT and Saab system can revolutionize offshore subsea operations by allowing the vehicles to recharge on the seafloor and thus remain in the water longer and reduce the reliance on support from manned vessels. The unmanned system can increase the range of the vehicle, increase operational weather windows for the operators, while improving safety for the crew.”

In addition, Saab Seeye said that its iCON-based hybrid AUV/ROV Sabertooth fitted with a Blue Logic charger is the world’s first system capable of remote docking operations. According to the company, the 3,000-m (9,842-ft) rated Sabertooth can be based at a remote location docking station ready to be launched on pre-programmed or man-controlled missions, including inspection, repair and maintenance, research tasks, and environmental monitoring. At the docking station, tooling packages are stored, batteries recharged, and data transferred via satellite or cable to shore.

Sonardyne International Ltd. has started a collaborative project to improve the autonomy for long-endurance AUVs. With partners L3 ASV and the National Oceanography Centre (NOC), the company will focus on longer-term navigational accuracy for AUVs in deepwater, while reducing power requirements and increasing autonomy in marine operations.

The Innovate UK-supported Precise Positioning for Persistent AUVs (P3AUV) project will involve trials using Sonardyne’s underwater positioning technology on the NOC’s Autosub Long Range (ALR) and L3 ASV’s C-Worker 7 autonomous surface vehicle (ASV). The project is due to run until late 2019.

P3AUV will focus on three key areas. One is to increase long-duration navigational accuracy by integrating low- and high-power inertial navigation system (INS) sensors. The second area is to improve positioning accuracy while underwater vehicles descend and ascend through the water column, through the integration of doppler velocity log current measurement capabilities and INS technologies with onboard data processing. The third area is to enable ASV deployment of seafloor positioning transponders.
The subsea gas compression technology on the Åsgard field is expected to increase the reservoir’s productive life by 15 years. (Photo by Elin A./Courtesy Equinor)

Technology gains taking subsea processing deeper, farther out

Industry advances helping meet field development challenges

JOHN MORGAN, REBECCA ROTH, LEE THOMAS, MATAI WILSON AND TERRY WOOD, INTECSEA

SINCE THE RELEASE of the first Worldwide Survey of Subsea Processing Technology poster in Offshore in 2008, INTECSEA has monitored the status of the technologies and systems used on the seafloor to enhance reservoir recovery rates. The technologies continue to mature with each successful field development application. However, it is a long and costly process to bring the technology to market. And sometimes the process takes longer to find the right match of the technology for a field development application. The greatest challenge for operators is the risk of using a new technology or a combination of technologies for the first time on a project.

To justify these risks, operators require that: 1) the technology bring a minimum of a 30% to 40% cost savings incentive, or 2) the technology is the enabler for the project to proceed. Either way, these are key drivers for operators to use subsea processing technologies on their project.

ALLIANCES, PARTNERSHIPS, AND JIPS

Because of the costly nature of bringing the technology to market, various alliances and partnerships have emerged (captured on the poster in Chart 1 – Subsea Supplier Matrix). Partnerships or collaborations can bring technologies which, when combined, result in even greater benefits. Additionally, collaborative efforts greatly reduce the costs associated with maturing the technology through to each TRL (Technical Readiness Level).

An assessment of the history of subsea processing reveals, that with each field development, it is not one technology, but rather the combination and integration of multiple technologies from multiple vendors which enable subsea technologies to work together to achieve the desired results. Because of the huge importance of integration, the role of one supplier to integrate and package the systems becomes critically important to the project.
JIPs (joint industry projects) are another path for bringing subsea processing technology to the market. A JIP consists of a specific group of operators and contractors working together to mature the subsea processing technology from conceptual studies through testing and piloting, and eventually installation and operation.

**SUBSEA COMPRESSION TECHNOLOGY**

Table 1 of the 2019 Subsea Processing poster shows two major compression projects (Åsgard and Gullfaks South Brent) which are currently operating. The success of these projects is providing the industry with confidence in subsea gas compression, and more operators are now conceptually evaluating subsea gas compression on other projects. These potential subsea gas compression projects are indicated in the “Current Status” column of Table 1 with a “C” for “Conceptual Project. Unfortunately, only publicly announced gas compression conceptual studies can be listed on the poster. However, according to the contractors and system integrators, many more such studies are under way but are confidential at this time.

Chevron has publicly indicated that subsea gas compression is being conceptually evaluated for the Jansz-Io fields which would negate the need for a multi-billion dollar offshore floating host platform. This is a prime example of the potential for technology to produce a significant cost saving that far outweighs the risk introduced by using the technology. In the case of Jansz-Io the cost savings would be significantly greater than the 30% to 40% threshold.

The risk of certain “unknowns” is reduced for operators considering subsea gas compression as Equinor gains experience and publicly shares information about their technical success and “lessons learned” from their Åsgard and Gullfaks South Brent projects.

The timeline for bringing subsea compression technology from concept to Åsgard’s first compression gas was 20 years. Conceptual development studies started in 1985, and operations started in September 2015. Future gas compression projects will be much faster due to the shared learnings from the Åsgard and Gullfaks projects.

In December 2018, MAN Energy Solutions’ first subsea compression trains at Equinor’s Åsgard field had achieved 50,000 operating hours with nearly 100% availability. This achievement helps operators to have greater confidence in the technology. And industry experience with gas compression helps other operators to reduce the level of risk for their field development conceptual studies. According to Equinor, the subsea gas compression technology on the Åsgard field will increase the reservoir’s productive life by 15 years and add 282 MMboe in reservoir recovery.

**LONG-DISTANCE TIEBACKS**

Pseudo dry gas systems are an emerging technology in subsea gas production boosting that is a promising, economically viable alternative to compression systems for long tiebacks of an approximate 100 km (62 mi) or greater. This innovative technology adapted from surface applications helps overcome the pressure losses due to gravitational affects in long tiebacks and deepwater depths.

![Diagram of Åsgard field](https://example.com/Åsgard_diagram.png)

This year’s Subsea Processing poster highlights a combination of technologies that in the future will enable operators to recover stranded gas fields using long-distance subsea tiebacks. The combined technologies of INTECSEA’s Pseudo Dry Gas liquids removal unit plus Fuglesangs Subsea AS’s (FSubsea) Omnirise miniboosting system with Voith’s integrated variable speed torque converter and magnetic coupling will enable liquids to be separated within the flowline and therefore increase gas flow. The removed liquids are then pumped through tubes in the umbilical or a small diameter liquids line to the host facility. The gas in the flowline contains less liquids after going through this separation process inline of the flowline. With dryer gas in the flowline gravitational losses decrease and the production throughput greatly improves.

**ELIMINATING VARIABLE FREQUENCY DRIVES**

Another technology is evolving due to the collaboration agreement between FSubsea and Voith. FSubsea has integrated Voith’s torque converter in its Omnirise Subsea pump. See the green box on the poster entitled: “Subsea Boosting Technology.”

The significance of combining these two technologies is to eliminate the need for a VFD (variable frequency drive) on the topsides or on the seafloor as a separate piece of equipment. This also eliminates the need for certain topsides equipment, hydraulic fluid connection, and signaling flying leads. FSubsea anticipates that its Omnirise Boosting System (1.5 MW pump shaft power) will be TRL-4 by 1Q 2020.
SUBSEA WATER INJECTION

Another technology that is maturing through the technical readiness level process is NOV’s Seabox subsea water treatment unit and SWIT Technology. According to NOV “the water treatment is done directly at the seabed and the treated water is pumped straight into the injection well.” The SWIT Technology provides the quality of water needed for injecting water in the injection wells “where it is needed and when it is needed.”

This emerging technology will reduce space and equipment on the floating host topsides, eliminate water injection flowlines and risers, and simplify the subsea hardware for the water injection system.

ConocoPhillips is currently testing the system during the 2018/2019 winter season in the North Sea at an offshore platform. It has taken 16+ years of development funded by the Norwegian Research Council, operators, and NOV in order to develop and test the technology. It may become a 20-year effort to get the technology in the field for full time use.

SUBSEA TIEBACK MILESTONES

Graph 3 from the 2019 Subsea Processing poster illustrates (as of February 2019) how the industry has continued to increase the tieback distance for subsea boosting projects. In 2018, Murphy’s Dalmatian field became the world’s longest subsea oil production tieback at 35 km (22 mi) using a subsea boosting system. This tieback record is 50% of the length of the longest natural flow subsea tieback distance – Shell’s Penguin A-E field tieback of 69.6 km (43.4 mi). In the next five to 10 years, it is anticipated that a combination of technologies applied to the right project will enable boosting tieback distances to exceed natural flow tieback records. Operators and contractors are working together to close this gap. Note that Asgard is the longest subsea gas production tieback.

Graph 7 illustrates (as of February 2019) the continued advancement of subsea boosting projects for the past 24 years starting with Eni’s Prezioso field in 1994 at 50 m (164 ft) to Shell’s Stones field in 2018 at 2,927 m (9,600 ft).

The graph shows how operators slowly gained experience and confidence in subsea boosting from 1994 to 2006. During this time an average of one subsea processing project per year was installed. Starting in 2007 the number of these projects installed more than doubled. And in 2014 and 2015, four to five projects were installed. Increasingly, operators are technically and economically evaluating the subsea boosting or compression option as one of their field development options.

CONCLUSION

Evaluation and adoption of subsea processing technologies by operators is not moving as fast and wide spread as contractors had hoped, but subsea boosting and subsea compression projects are increasing in frequency. Some in industry feel that the industry downturn has slowed down the number of subsea processing projects. However, this downturn has forced contractors and operators to develop more cost-effective solutions which ultimately will help accelerate the use of subsea processing technology on projects around the world.

The emerging technology in the future will allow operators to reduce equipment on the host topsides and eliminate some equipment on the seafloor. Simplification and size reductions will make the technology less costly and ultimately help to economically justify a more widespread use of the technology.

No matter what technology is used, the ultimate goal for all subsea processing technology is to help operators improve the recovery percentage of the reserves by increasing the productive life of the field or accelerating the production during the field decline.

EDITOR’S NOTE

This issue of Offshore contains the 2019 Worldwide Survey of Subsea Processing Technology poster, the twelfth installment of this industry resource. The primary aims of this poster are to chronicle the development and developers of these systems and to document the continued commitment of oil companies to the application of these technologies. For online access to view and download all posters, please visit http://www.offshore-mag.com/maps-posters.html.
Vessel-based decommissioning system offers economic alternative

FRANCIS MCGEEHAN, DAVID COULL, AND JAVIER FALCON, OCEANEERING

WELL DECOMMISSIONING is traditionally performed from drilling rigs due to the complexity of operations and the available technologies and methods, which often include risers, divers, and explosives. However, rigs are expensive to operate compared to vessels, and often do not have the flexibility to change locations on short notice.

Increasingly, operators are looking to a vessel-based approach—as well as the innovative application of tooling solutions—to not only keep decommissioning project costs down, but also to reduce non-productive time and safety risks to workers. A vessel-based approach could reduce costs by as much as 50%, in part due to lower spread rates and the ability of vessels to quickly move. Additional cost reductions are achieved through the ability to live stream operations, which enables faster decision making and allows some operations to be controlled remotely. Further cost reductions also can be realized with multi-client campaigns where mobilization and transit costs are shared.

Oceaneering employed a vessel-based approach in 3Q 2018 for the most recent phase of a six-year decommissioning campaign. Two major North Sea operators needed a plan for an eight-well plug and abandonment (P&A) and well severance campaign in the Danish and Norwegian sectors of the North Sea. Because a wide range of equipment was needed for different workscopes, the campaign was divided into two distinct phases to reduce the operators’ costs without compromising operational efficiency or safety.

PHASE ONE

The project’s first phase focused on two wells offshore Denmark. Work involved casing cutting and pulling and annulus perforation on a mudline suspension well. However, the most significant challenge of the campaign’s first phase was presented by the second well. This well had a temporary abandonment (TA) cap that needed to be removed, and the potential existed for retained pressure to be found below the TA cap.

Previous attempts to safely gauge pressure below the TA cap using standard procedures had failed due to an unusual field modification made 30 years ago. In case operations had to be suspended, the physical tooling solution’s final arrangement also...
needed to be capable of being left in situ without concern for an uncontrolled release of hydrocarbons into the environment.

The decommissioning team and supply chain partners determined they would need to source existing oilfield equipment that could be quickly and cost-effectively repurposed to offer a competent technical and commercial solution. Instead of employing normal drill pipe intervention techniques, the team used an annular BOP as a stripper, mating it to a proprietary slip-lock conductor connector, in a new tooling configuration called the conductor stripper assembly (CSA).

The CSA was tested and then deployed in combination with a specially constructed workstring arrangement. The workstring arrangement allowed for the subsea containment, monitoring, venting, fluid diversion, and automatic pressure relief of any potential well fluids—all while allowing the workstring to operate with a mixture of manual-operated equipment (chain tong) and mechanical-operated (drill pipe tongs) equipment and without returns to the vessel.

The CSA was deployed with the MV Island Valiant vessel. The project team also enabled 24/7 live streaming of subsea operations direct to the operator’s project team. The live streaming improved efficiency as it allowed the onshore teams to review what was occurring in real time. It also eliminated the need to send video clips and images and descriptions back and forth for discussion, or for an operator to send a representative offshore to monitor operations.

The first well that the team worked on was prepared for the subsequent setting of a surface cement plug. The second well was inspected, the condition verified and original equipment manufacturer documentation provided to the client.

The first phase not only marked a new application of existing tooling, but also was conducted from a vessel instead of a jackup drilling rig. This particular operator first approached Oceaneering in 2012 for information on the flexibility and cost-effectiveness of a vessel-based solution for the P&A of North Sea wells. Multiple rig moves would have been cost prohibitive as these wells were not in the same area.

Using a vessel not only saved the operator the costs of renting and moving a jackup, but also provided the ability to change locations if an unexpected challenge arose. This capability allowed work to continue while a solution for a challenge was simultaneously developed. During the campaign, the vessel had to change locations when the TA cap encountered proved to be a different type than that specified in records. Due to this discovery, the TA cap assessment had to be performed onshore. The top of an existing bridge plug was also found deeper than expected, requiring a bridge plug be mobilized from shore.

Since starting work for this operator in 2012, Oceaneering has conducted P&A operations for 28 suspended exploration and appraisal wells, mostly mudline suspension wells drilled between 1966 and 1998 in water depths ranging from 110 ft to 237 ft.

PHASE TWO

The project’s second phase—conducted from the offshore construction vessel Olympic Zeus—centered on well cementation, well severance, wellhead recovery, debris clearance and seabed clearance survey activity for six wells offshore Denmark and Norway. The integrated project team was provided with well data, well-specific work programs, wellhead severing tooling, the Olympic Zeus and a Magnum work-class ROV.

Beyond the normal scope of supply, the team also deployed an existing cement support tool (CST) in a new manner. To prevent cement from slumping inside a well, a retainer is typically set—usually a mechanical plugging device such as a bridge plug—inside the wellbore at the lowest elevation that the cement plug will be set. However, this method can be both complex to run and expensive due to the one-time use of the component, additional equipment requirements and need for additional personnel offshore.

First, the CST was placed inside a deployment stinger tool. Next, a water hose was then attached to the top of the stinger. Finally, water was pumped down the hose into the stinger, which in turn pumped water out of the CST tool, allowing it to open and set at the required depth. The CST was deployed with the vessel’s 20-ton offshore construction crane and guided into place by the ROV.

Finally, all the wellheads were cut 10 ft below the mudline (seabed) using the patented abrasive water jet cutting technology developed by Oceaneering, and all debris was recovered so the seabed was returned to its original state. All project HSE, operational and KPI objectives of no harm to workers, no high potential incidents, no environmental harm, and no falling objects also were achieved without the use of divers, guide wires, or explosives.

The campaign’s first phase was completed in 16.5 days, with an average of five days per well (excluding transits and mobilizations). The second phase was completed in 15 days, with an average of 16 hours per well (excluding transits and mobilizations). Using a vessel-based approach to decommissioning substantially reduced the transit time to and from the site.

As the oil and gas industry continues to focus on cutting costs and reducing workers’ exposure to safety risks, the use of a vessel-based approach to decommissioning will likely continue to grow in the years to come.
WEATHERFORD INTERNATIONAL plc has announced a major enhancement to the ForeSite production optimization platform. Among the top features of the new release is expanding predictive failure analytics to electric submersible pumping systems (ESPs) and adding complete optimization capabilities for plunger-lifted wells.

The platform is designed to expand on its ability to reciprocate rod lift by adding predictive failure analytics for ESP systems. By predicting an ESP failure before it happens, the company says that this capability not only reduces failure frequency, it also reduces total downtime and lost production by enabling proactive failure management and planning.

Adding plunger-lift optimization builds on previous optimization capabilities in rod lift, gas lift, natural drive, and ESP-lifted wells. Rather than the status quo—using a trial-and-error method to adjust operating pressures—ForeSite enables real-time optimization and surveillance along with intelligent alerts, well modeling, plunger-cycle design and more.

Weatherford also says that the platform is now also edge-computing ready. Combined with advanced IoT-enabled hardware and CygNet SCADA software, placing ForeSite modeling capabilities at the wellsite can increase asset profitability, productivity, and uptime. The capability paves the way for the next-generation automation system, ForeSite Edge, the company says.

Finally, Weatherford says that the enhancement includes automated well testing and the ability to execute well-work activities in the field via ForeSite Mobile.

Weatherford first introduced the platform, which combines physics-based models with advanced data analytics to improve performance across wells, reservoirs, and surface facilities on a single, secure platform, in May 2017.

“Since its launch, ForeSite has been deployed around the world with unmatched success, enabling operators to identify and prioritize their production opportunities,” said Kyle Chapman, President of Production for Weatherford. “Simply put, the new ForeSite release gives operators the field-wide intelligence that they need to monetize their data. The new capabilities added to ForeSite combine an unprecedented ability to monitor performance and recognize current and future improvement opportunities across all reservoirs, wells, surface equipment, and pipelines. This is the field of the future.”
Crane adapted for deeper water wind farms

STUART SMITH, SPARROWS GROUP

NEAR-SHORE WIND FARMS are traditionally located in water depths of up to 30 m (98 ft), with mono-pile foundations mounted to the seabed. Typically, standard davit cranes with short fixed booms are deployed from these installations to lift and lower materials from supply vessels. However, as wind farms move into deeper waters, the foundation changes to a lattice or jacket with a wider footprint, increasing the crane’s radius requirements in order to reach the supply vessel. This in turn creates a need for a more traditional offshore-type crane with greater functionality.

Sparrows Group has devised a new lifting solution, the WindMaster crane, to accommodate the larger structures in deeper waters. It employs an 8-m (26-ft) boom with full powered slewing, luffing and hoisting functions that allow it to access decks of supply vessels even in higher sea states. Recently the company signed a contract to supply 103 WindMaster cranes for installation at ScottishPower Renewables’ 714-MW East Anglia ONE wind farm off the Suffolk coast in southeast England. This is due to generate first power later in the year and should be fully operational by 2020. A crane will be installed on each of the farm’s 102 wind turbines with a further crane used for training purposes.

STRENGTH ASSESSMENT
All cranes have a deflection rate – an ability to flex so that they can absorb the loading forces that come from lifting a heavy weight in a dynamic situation – and accuracy was critical in order to reduce the load impact of the new design. Ropes provide most of the required deflection due to their flexibility: one of the main challenges was to optimize the hoist ropes to ensure sufficient strength to comply with minimum safety requirements but at the same time not to the extent that they

WindMaster crane under development. (All Images courtesy Sparrows Group)
became too rigid, as this would increase the dynamic forces that affect the specification of all the other crane components.

Unmanned wind turbines require regular maintenance and a robust protection system is a must to prevent corrosion. Cranes on offshore turbines are generally 15-25 m (49-82 ft) from the water line: as steel naturally corrodes in this environment, alternative materials were adopted where possible for the new design such as nylons, GRP and stainless steels. A protective paint system was applied with care taken to avoid potential contact with or chipping of the coating that might degrade the corrosion resistance. For areas of the crane where stainless steel and general carbon steel are in contact, an insulator was applied to limit the impact of accelerated galvanic corrosion that can often occur between these materials.

Due to a lack of regular accessibility once deployed in-field (since the turbines are unmanned), reliability of the crane would be critical. To eliminate the chance of water ingress and material deterioration a PTFE coating protection was applied on steel components in combination with a marine sealant. For pinned connections, a two-part xylan coating was adopted consisting of a xylar hard bonding agent with a xylan PTFE coating on top, which insulates the material. Nylon was used for the crane sheaves and spacers inserted between any moving components to provide wear protection.

Sparrows has transferred its knowledge from years of experience in the offshore oil and gas industry for the new offshore crane. As the renewables sector continues to expand and evolve, new challenges will emerge, and the supply chain must be prepared to adapt and meet those needs.

THE AUTHOR
Stuart Smith is head of design and technology at Sparrows Group.
Motion compensation technology improves decommissioning operations

DECOMMISSIONING DONE SAFELY and efficiently is what clients expect, especially so in the North Sea. Ampelmann, an offshore access solutions and services provider, has seen a rise in the demand for its technology to enable the safe and efficient transfer of personnel, utilities, and cargo during the late life and decommissioning of offshore platforms.

Over the past year, the company has worked together with a heavy-lift marine contractor to help prepare an offshore platform in the southern North Sea for decommissioning. With the use of the Ampelmann A-type gangway system, the client was able to reach the multiple landing locations necessary to remove the platform in parts. The A-type also provided a safe escape route in the case of an emergency.

More recently, the company worked on and completed a short shutdown campaign to allow production-enhancing work to take place.

The main challenge in the late life and decommissioning stages of a platform is maintaining efficient operations. Production is decreasing steadily, while it still takes resources to keep all utilities functional. The key is in finding innovative offshore solutions that can keep the last two aligned.

One of the largest decommissioning expenses for an asset owner is the operation of the facility, including power generation and utilities, also known as ‘life support’ systems, from when it ceases production to completion.

With full motion compensation technology, operational costs are optimized by extending the weather window, decreasing the duration of campaigns, and providing alternatives to capital-intensive assets, such as jackup rigs and heavy-lift vessels.

Ampelmann is working with the Oil & Gas Technology Centre (OGTC) to develop a life support solution that enables clients to keep operational costs low during late life and decommissioning. Launched in February 2017, the OGTC is a not-for-profit, research and knowledge company, which aims to become the go-to technology center for the oil and gas industry in the UK and globally.

The concept that the two companies are working on essentially uses motion compensation to provide a host of services year-round to maintain aging and dormant facilities awaiting final lift preparations. Utilities such as water, high pressure air, diesel, and power can be delivered with personnel on a dedicated vessel. It is a scalable, modular, and a re-useable system along with being capable of providing piece meal decommissioning services also by use of its innovative motion compensated lifting platform.

OGTC and Ampelmann are in the feasibility stage of the project actively looking for industry input and potential partners. Decommissioning as well as most of the offshore access industry is becoming increasingly collaborative. It is plugging in the right solution at the right time. By working together, various industry stakeholders can combine innovative solutions and services to get the most out of their decommissioning operations.
HWCG selects m-pipe for emergency well containment riser

HWCG, a deepwater oil and gas emergency response consortium for the US Gulf of Mexico, has commissioned Magma Global to qualify m-pipe for a 350°F (177°C), 15,000-psig rated riser to augment its emergency well containment system.

The lightweight, flexible m-pipe section, HWCG claims, will enable a quicker response in shallow waters and for floating production facilities where vertical access may be a challenge.

The flexible riser would remain in a ready-for-deployment mode on the US Gulf Coast for deployment following a subsea well blowout. When installed to capture hydrocarbons it could remain in place for up to six months while a relief well is drilled.

The company says the design envisions approximately 800 ft (244 m) of m-pipe connected on one end to a rigid riser and on the other end to the incident well. The m-pipe will form a lazy wave between the two rigid ends thereby decoupling motions and improving operability. Using a temporary flowback solution, hydrocarbons are processed via the riser system and then collected in tankers for transportation.

The consortium’s members have identified a range of potential demanding containment scenarios requiring high-pressure/high-temperature performance. HWCG selected m-pipe for its pressure and temperature performance, its lightweight and flexible properties which enable heave compensation at the base of a steel riser, because it is suitable for a wide range of fluids, provides low frictional resistance, and is resistant to abrasion.

Andy Butcher, Test Engineering Manager at Magma Global said: “The m-pipe design has already undergone extensive testing, both to assess materials properties and performance of the carbon fiber composite pipe, and the interface of end fittings to the pipe under typical operating conditions. The operational requirements for the HWCG applications are at temperatures above the normal test conditions. Therefore, Magma will carry out additional testing to confirm m-pipe performs satisfactorily at elevated temperatures for deployments of up to six months.

“These additional tests will include assessing the performance of the pipe and end fittings while subjected to the pressure and higher temperatures required for HWCG. Burst tests will be used to determine the pressure that failure occurs. There will also be tests to assess the long-term effects of pressure combined with the HWCG high temperature requirement. This will involve test items being subjected to a constant pressure while also being maintained at high temperature for six months.”

This sample of Magma’s m-pipe is about to undergo a burst test and has been fitted with strain gauges to record effects as pressure inside the pipe increases. Displacement transducers will record any movement of the end fittings relative to the pipe. (Courtesy Magma Global)
**BUSINESS BRIEFS**

**PEOPLE**

Brian F. Maxted, chief exploration officer and founding partner of Kosmos Energy, has retired. The company has appointed Tracey Henderson as chief exploration officer.

Chevron Corp. has appointed Pierre Breber as vice president and CFO, effective April 1. He succeeds Patricia Yarrington, who has decided to retire after 38 years with the company.

Effective April 1, Liam Mallon will become president of ExxonMobil Upstream Oil & Gas Co.; Steve Greenlee will become president of ExxonMobil Upstream Business Development Co.; Linda DuCharme, will become president of ExxonMobil Upstream Integrated Solutions Co.; and Neil Duffin will become president of ExxonMobil Global Projects Co.

MODEC has appointed Yuji Kozai as president and CEO and Toshiro Miyazaki as chairman of the board.

US President Donald Trump has nominated David Bernhardt as Secretary of the Interior.

Eugene T. Coleman, executive vice president, Exploration and Business Development at Murphy Oil Corp., has elected to retire after 17 years with the company. Michael K. McFadyn has assumed responsibility for Exploration and David R. Looney for Business Development.

Wintershall Middle East has appointed Helge Beuthan as general manager.

MHWirth has appointed Pete Miller as executive chairman and Eirik Bergsvik as CEO.

Schlumberger has named Olivier Le Peuch as COO.

Hoover Ferguson has appointed Kevin Friar as president.

Xodus Group has named Caragh McWhirr as innovation manager.

Ryan Lumsden has joined Saab Seaeye as business development manager.

ROVOP has appointed Lee Wilson to the newly created role of head of technology.

Renato Bastos has joined Airborne Oil & Gas as vice president Brazil.

Jim Sledzik has joined Saudi Aramco Energy Ventures-US LLC as managing director.

Nizami Musayev has joined Tendeka as area manager in Russia.

Peter Bradshaw has joined Tata Steel as technical sales manager – Energy & Power.

Pharma-Safe Industrial has hired DeWayne Misner as executive vice president of health, safety and environmental management.

Stuart Clow has joined OPITO as director to support global operations.

ValvTechnologies Inc. has appointed Mark Abbott as director of engineering and Keith Whittaker as director of global quality management.

**COMPANY NEWS**

Exxon Mobil Corp. says it will streamline its upstream organization and centralize project delivery across the company to support its plans to double operating cash flow and earnings by 2025. Effective April 1, the reorganization will involve creation of three new upstream companies. ExxonMobil Upstream Oil & Gas Co. will focus on end-to-end value chain management in five distinct global businesses – unconventional, liquefied natural gas, deepwater, heavy oil, and conventional. ExxonMobil Upstream Business Development Co. will oversee strategy development, exploration, acquisitions and divestments and actively manage the upstream portfolio. ExxonMobil Upstream Integrated Solutions Co. will provide technical and specialized commercial skills, such as drilling, research and technology, gas and power market optimization, and the global deployment of resources.

SBM Offshore is adopting a new resourcing model to support anticipated growth in demand for offshore engineering services. It will involve not only recruiting new engineering staff, but also a much higher degree of subcontracting of partner companies and individuals than in the past, giving flexibility to ramp up or down depending on market conditions. As part of this new arrangement the company is creating a ‘high value engineering center’ in Bangalore, India, with long-term partner Nauvata which will provide detailed design services for SBM Offshore projects. The new center will initially have a light structure but will be able to respond to a rapid growth in workload.

James Fisher and Sons plc has acquired Saudi Arabia-based Murjan Al-Sharq Marine Contracting LLC. The acquisition harnesses local talent to bolster provision in the nearshore marine construction and maintenance market.

BP Ventures is providing $5 million...
in finance to Belmont Technology to support the major’s artificial intelligence (AI) and digital capabilities in its Upstream business. The Houston-based technology start-up has developed a cloud-based geoscience platform that employs AI. The platform’s capabilities include specially-designed ‘knowledge-graphs’, with BP supplying the platform geology, geophysics, reservoir and historic project data. This information is intuitively linked together, identifying new connections and workflows, creating a knowledge-graph of the company’s subsurface assets. BP engineers can ask the knowledge-graph questions in natural language, with the technology using AI neural networks to interpret the results and conduct fast simulations. According to BP, the goal is to accelerate the project lifecycle process, from exploration through reservoir modeling, via a 90% reduction in the time taken for data compilation, interpretation, and simulation. The investment will allow Belmont to grow its workforce, extend Sandy’s capabilities, and accelerate deployment of the product.

WellConnection Group, a Norwegian inspection, maintenance and repair company, has acquired Peterhead-based Independent Oilfield Services (IOS). This deal marks the company’s entrance into the UK market. IOS will change its name to WellConnection IOS.

Oil Spill Response Ltd. (OSRL) has expanded its member offer with the launch of an unmanned aerial vehicle (UAV) service. The new service aims to enhance preparedness and response capabilities to better support members’ needs in the event of a spill. OSRL has signed call-off agreements with several third-party UAV providers including Bristow Aerial Solutions, Sky-Futures, and Vertical Horizon Media. The call-off agreements will provide its members with pre-agreed rates, defined mobilization procedures, and a standardized approach to managing common preparedness and response activity.

Global Marine Group (GMG) has acquired a 13.8% interest in subsea survey/ROV specialist Rovco. GMG, which has three business units – Global Offshore, CWind, and Global Marine – will work with Rovco to provide wide-ranging subsea solutions to improve data acquisition.

Subsea equipment rental, sales and services provider Ashtead Technology has formed a strategic partnership with 4Subsea. Ashtead will add 4Subsea’s sensors to its IMR services portfolio, also gaining access to 4Subsea’s specialists in subsea production, well intervention, and drilling. In turn, 4Subsea should strengthen its position in the global sensor market by accessing hardware and digital services delivered through Ashtead’s network which includes facilities in Aberdeen, Abu Dhabi, Halifax, Houston, and Singapore.

James Fisher Offshore and First Subsea have teamed up to develop internal cut and lift technology (ICLT) for offshore decommissioning projects. The development combines James Fisher’s abrasive jet cutting technique with First Subsea’s ball and taper internal lifting tools, including the Ballgrab gripping process, to provide what is claimed to be a simple, flexible and swift method for removing redundant subsea equipment and tubulars. ICLT is due to be fully commercialized soon.

John Lawrie Group (JLG) will establish a new metal recycling and decommissioning base at the Port of Dundee on Scotland’s east coast after reaching an agreement with Forth Ports. The two organizations will invest a combined £5 million ($6.46 million) in redeveloping an existing two-acre site to create a new purpose-built concrete pad. JLG will use it to dismantle redundant offshore infrastructure brought ashore and for metal processing operations. The company’s metals division will run the new facility, which is due to be operational in early 2020, at which point up to 10 new full-time jobs will be created.

Ampelmann has opened a new office in Sakhalin, Russia.

SNC-Lavalin Group has opened its new European headquarters at Nova North in Westminster.

Leonardo has opened its Gulf of Mexico Support Center in Broussard, Louisiana. The 21,000-sq ft (1,951-sq m) facility provides blade repair, spare parts, and technical support.

Bagwell Energy Services has announced plans to create 150 new jobs in the next five years and make a $2.5 million capital investment at its Port of Delcambre fabrication center in Iberia Parish. The investment will add precision fabrication equipment for process industry piping and vessels, install new bridge cranes, and build a 15,000-sq ft (1,394-sq m) addition to its fabrication center and a 4,000-sq ft (372-sq m) addition to its painting-and-blasting facility. The project will retain 46 existing jobs while creating 150 new direct jobs.

Airbus Helicopters Inc., based in Grand Prairie, Texas, is celebrating 50 years of sales and support for US helicopter operators, while Airbus Helicopters Canada Ltd., located in Fort Erie, Ontario, is marking its 35-year milestone.

Bishop Lifting Products has acquired Woods Logging and Industrial Supply, a spooling services, rigging products, wire rope and hydraulic solutions provider.

Penspen has opened an office in Bogota, Colombia.

Survitec has opened a new service and distribution hub in Singapore.

Claxton has opened a new office in Stavanger, Norway.

Wind Point Partners has entered into definitive agreements to simultaneously acquire and merge Clock Spring Company Inc. and Neptune Research LLC. The combined business will be named ClockSpring|NRI.

Danos has reached a tentative agreement to acquire the assets and business of Shamrock Energy Solutions, a privately held 22-year-old oilfield service company, based in Houma, Louisiana. The deal is expected to be effective this month and will increase the number of Danos employees by nearly 50%, from 2,200 to 3,200. The closing is subject to certain remaining contingencies.
Improved collaboration can drive down drilling opex

THE OIL AND GAS INDUSTRY was plunged into turmoil when oil prices crashed in 2014. To get back on track, it has been forced to devise and implement new ways of working and embrace new solutions in order to remain profitable, while the price of oil continues to fluctuate. At the same time, offshore operators and drilling contractors have had to step up efforts to reduce their environmental footprint so as to comply with new legislative demands, while at the same time seeking ways of shrinking their operating expenditures.

Effecting sustainable opex reductions is no simple matter. It involves careful risk management, better cost predictions, and an increased commitment to remote services in order to, for example, maximize the availability of equipment, optimize fuel costs, and prevent unforeseen issues. With the responsibility for fuel costs increasingly shifting from oil companies to drilling contractors, streamlining these services can have a favorable impact on the profitability of a contractor’s operations.

Smart technologies are available that enable step-changes in efficient and which provide environmental and financial benefits. One favored way for operators to reduce opex is to switch to unmanned offshore operations. Drilling contractors are moving in the same direction, however not at the same speed. One example is the ballast control room operator, which is no longer an individual role for the majority of floating drilling rigs as was the case in the past.

Increasingly technological enhancements are eliminating more personnel positions on rigs. Today technologies are becoming available for running engine control rooms fully unmanned, which is already a standard way of working in the marine sector. Manned engine rooms are enforced to ensure fast intervention in the case of a failure. The industry needs to recognize that technology has advanced, and blackout recovery situations are resolved more slowly with human intervention than with an automated sequence.

In the same way, primary DP operations are increasingly being moved onshore. DP operations can be handled in an onshore control center, lowering costs and increasing the flexibility for manning the position. Wärtsilä has successfully tested remote DP operations of an offshore supply vessel in the North Sea, controlled from San Diego, California. To draw on a parallel form outside the industry, remotely controlled military drones are now well established and proven to be technically feasible.

However, offshore drilling is also subject to stringent environmental legislation that has led to the industry being increasingly regulated. Environmental taxation, in Europe in particular, is a major motivator for the offshore sector to find new ways of reducing its carbon-dioxide (CO₂) and nitrogen-oxide (NOₓ) emissions. Regulations will only get tougher, so ignoring this dilemma is no longer possible.

To reduce the environmental footprint, some level of capex investment is unavoidable. This however presents a challenge as the capex burden increasingly rests with the drilling contractor, whereas the lower opex achieved by reducing the environmental footprint tends to benefit the oil company. Until recently, oil companies have had to bear the cost of fuel as well as the taxes on CO₂ and NOₓ emissions. However, a clear trend is now emerging whereby the fuel costs of drilling operations is shifting from the oil company to the drilling contractor and with it, the relevant taxes.

A sustainable reduction in energy consumption and emissions requires digital mapping and a baseline of the asset’s environmental impact. When this baseline is linked to the relevant energy consumption data, it is easy to identify improvement areas and to calculate the return on investment (ROI).

In the present uncertain scenarios, the oil and gas industry needs to find new ways of operating and new set-ups to ensure sustainable profitability. This requires joint efforts between oil companies, drilling contractors, and third-party service providers, with all sharing the gain or pain of an operation. When each party carries a share of the risk but also shares in the rewards, the motivation for collective success is high.

For service partners, it means looking beyond mere maintenance toward helping the oil company and the drilling contractor reduce their opex in a sustainable way, while at the same time improving the efficiency of their operations and ensuring better environmental performance. For drilling contractors, a growing awareness of, and attention to, the environmental footprint may well increase the costs of keeping operations sustainable at all times. On the other hand, a drilling contractor’s proven ability to deliver both environmental sustainability and low operational costs will, in today’s climate, increase its chance of winning the next oil company contract.

JESPER BONDE, WÄRTSILÄ OIL & GAS

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<td>PHONE +49 (0) 2903 3385 70 • FAX +49 (0) 2903 3385 82</td>
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<tr>
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