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# Offshore Russia

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- Sakhalin weather
- Arctic
- LNG
- Deep saturation diving

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# Contents






**Cover Story**

## Offshore Russia

OE takes an in-depth look at projects and activities off Russia with dispatches from CERAWeek and LNG17 regarding Russia's bid for speedy Arctic recovery and new LNG facilities; a spotlight is shone on a new multi-chamber saturation diving system for the Russian Navy; on increasing interest and activity in the Arctic's established staging areas; and marine meteorology is discussed off Sakhalin.


ON THE COVER

Built in Japan in 2008, the Cyprus-flagged *Grand Aniva* LNG tanker waits to leave the Aniva Bay terminal off Sakhalin Island's southern coast after loading. (Photo courtesy of Sakhalin Energy)

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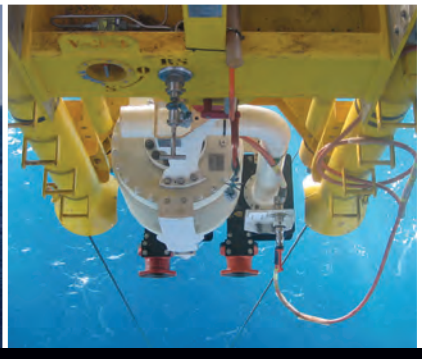

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## What's trending

### Joint effort to boost EOR on UKCS

The UK's DECC and industry created an EOR work group to assess technologies in an effort to jointly combat declining production on the UKCS.

## People

### Moniz confirmed

The US Senate unanimously voted to confirm MIT physics professor Ernest Moniz as Barack Obama's new Energy Secretary, replacing outgoing Secretary Stephen Chu.

## People

### Lawler joins Chesapeake

Chesapeake Energy will install Anadarko executive Robert "Doug" Lawler as its new CEO later this month.

## South Pars investment

Iran will invest US$16 billion to develop the offshore South Pars gas complex.

## Expert Access

**Managing Offshore Assets: Taking on the Information Challenge**

Join us on 12 June 2013 at 10:00 CST as we host a live presentation and Q&A with Gonzalo Merchan, director of the Global Energy Sector Information Intelligence Group, EMC Corp. on how to manage and share asset information in a real-time environment.

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# INCEPTION

THE BEGINNING OF AN IDEA

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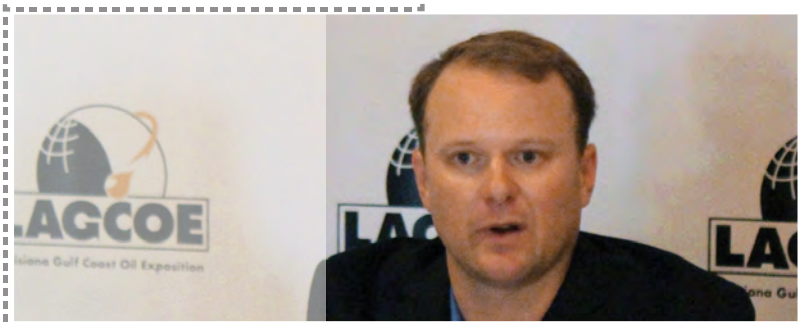
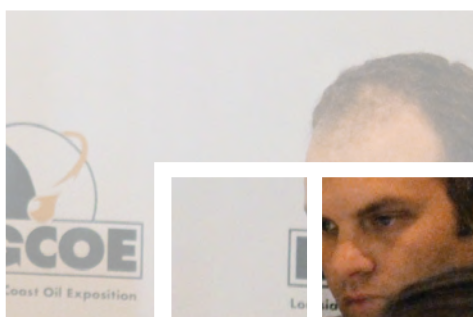
Louisiana Gulf Coast Oil Exposition



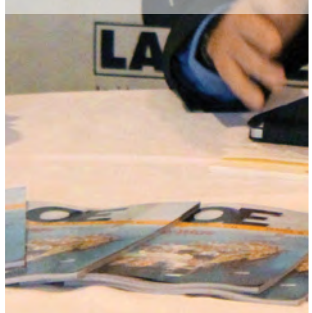


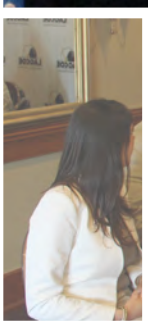



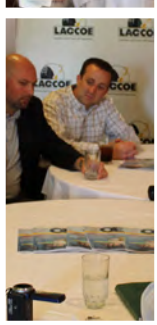
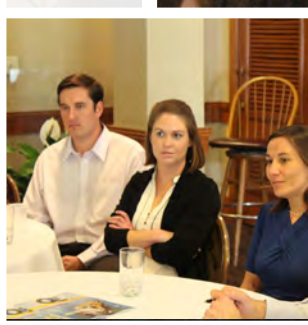








# Young Professionals of LAGCOE

The human capital shortage is recognized as one of, if not the most important, challenges facing the global oil and gas industry. Cultivating young talent into future leaders will be instrumental for the industry to realize ongoing growth. The Young Professionals of LAGCOE was an idea born out of addressing this need. Here, the YPL leadership team and ***OE*** discuss the responsibilities and opportunities their generation have in satisfying this requirement. ***OE*** recognizes and celebrates the YPL Committee as a great example of one idea leading to multiple ideas for the overall benefit of the industry.

YPL

Standing L to R: Travis Ritz. Completions Engineer, Stone Energy Corp; Michael B. Boudreaux, Deepwater Logistics and Procurement , Stone Energy Corp; Tom Hebert, Sales Representative, Frank's International; J. Taylor Brazzel, Drilling Engineer, Chalmers, Collins & Alwell, Inc.

Seated L to R: Ben Broussard, Director of Marketing & Membership Development, Louisiana Oil & Gas Association (LOGA); Hollie Citron, Business Development, Offshore Process Services; Kelsey M Corrigan, Drilling Engineer, Chevron; Susan Frizzell, P.E., Sr. Engineer, DART Energy Services; Joshua Credeur, Production/Operations Engineer, Marlin Resources, LLC.

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# Voices

**A post-Macondo world.** Eleven men lost their lives and thousands of gallons of oil surged into the US Gulf of Mexico on April 20, 2010. On the 3rd anniversary of the spill and the 25th anniversary of Piper Alpha disaster, OE asked,

## "What has the industry learned since Macondo?"

A key learning post-Macondo is how effective the industry is when it collaborates. The creation and support of new organizations like the Center for Offshore Safety demonstrates the commitment, capacity, and capability of the industry to continuously enhance safety and environmental protection. The second learning is the importance of SEMS, and how these systems maintain focus on both personnel safety and process safety. The use of safety management for continuous learning and improvement, for enhancing skills and knowledge, and for analyzing, establishing, and maintaining barriers to major hazards has a renewed and enhanced spirit of industry commitment.

**Charlie Williams, Executive Director, Center for Offshore Safety**

The complexity of well design and drilling requires teams of talented individuals, yet individual decisions can make or break a well. We have learned that any individual on the team can be liable for the well and that we need even stronger processes to catch bad decisions and create redundancy to avoid the rare catastrophic event. The next generation of deepwater drilling technology must closely link the mechanics of well design and well behavior to the complexity of the earth with models that are constantly updated with real-time data.

**Peter B. Flemings, Research Scientist, Institute for Geophysics, and Jackson Chair in Geosystems at the University of Texas at Austin**

There's been a much greater focus on well integrity since Macondo. However, well integrity is still viewed as a reactive process, with an increased focus on well monitoring and problems dealt with only after occurring. There is a real need to redefine well integrity - or proactive planning - and tackle weak spots and trouble zones at the well planning stage, and creating downhole isolation throughout the life of the well. The result will be reduced risk and safe, profitable and productive wells.

**Kevin Stewart, CEO, Meta Downhole**

The energy industry really rose to the challenge following Macondo, including with investments made in Helix Containment Solutions and Marine Well Containment. In 2011, we refocused the Department of Energy research and development program towards environmental stability and safety, and looked at the issues that arose from Deepwater Horizon and also those that may be around the corner. It's a moving playing field. Ongoing collaboration with industry ensures government is doing the right thing. Technology keeps moving and we're producing from formations and reservoirs that would have been unthinkable years ago and that's because industry does a very good job at marshaling capital resources, research and development.

**Christopher A Smith, Acting Assistant Secretary of Fossil Energy, US Department of Energy**

Learning opportunities laid in our people, our technologies and our processes. We recognized there were five specific areas that could and would be realized: prevention and drilling safety, containment, relief wells, spill response, and crisis management. Along that journey, a world of new learnings unfolded. None of us had a true appreciation of the scale and magnitude of challenges we would face with data management. We had to build communications infrastructure. BP received 125,000 ideas on how to plug the well, with 100 suitable for field testing and 45 able to be deployed. BP employs 20,000 people in the Gulf of Mexico. (Macondo was) very real, very personal, and very humbling. Work is still ongoing, but the future looks encouraging.

**Mike Utsler, President, Gulf Coast Restoration Organization, BP**

Macondo is another oilfield tragedy that serves to reinforce that we – as an industry – have to commit to continuous improvement of safety systems and technology. Even more importantly, we must commit to continuous rigorous compliance to procedures and regulations designed to deliver safe operations whatever the circumstances or cost.

**Bob Will, CEO, EFC Group**

After Macondo people are more conscious about the risks that exist and are looking for technology to help. The workforce culture has changed a lot and hazards are being indentified. We as a company train for hazard identification. After Piper Alpha, the culture changed in the North Sea. We will work safe before we work quicker. In the Gulf of Mexico there are similar approaches, but it is not as ingrained. Culturally, there is a bit of a shift.

**Mike Neill, US President, Petrotechnics**

**Go to OEDIGITAL.COM and give us your opinion on this month's topic!**

Nina Rach

# Colloquy

# Safety first... in the North Sea

Beginning this month, we recognize the 25th anniversary of the Piper Alpha disaster.

The Piper Alpha production platform was operated by Occidental Petroleum (Caledonia) Ltd. in the UK sector of the North Sea, about 120 miles (193 km) northeast of Aberdeen. It caught fire and exploded on 6 July 1988. There were 225 men aboard but only 59 survived; 165 died on the platform, along with two men on the stand-by vessel *Sandhaven*. The site of the wrecked platform is now marked by a buoy.

Two events in Aberdeen this month follow on:

- Piper 25 is an offshore safety conference chaired by Oil & Gas UK chief executive, Malcolm Webb, to reflect on lessons learned and reinforce industry commitment to continuous improvement [June 18-20, Aberdeen Exhibition & Conference Center].
- Workforce Involvement Day, a parallel "fringe" event on June 19, is jointly organized by Step Change in Safety and the UK's Health & Safety Executive (HSE), and sponsored by Apache, Baker Hughes, Royal Dutch Shell, and Wood Group PSN.

This day is designed to engage the workforce in safety matters and will include the screening of a 25-minute film at the AECC that challenges workers to think differently about their safety. The organizers hope it will be simultaneously shown to workers on every offshore installation on the UK Continental Shelf.

Step Change in Safety team leader, Les Linklater, said: "The legacy of Piper Alpha affects every offshore worker even today... Piper Alpha isn't just history and we still have to guard against complacency. The same hazards and the same challenges that existed back then still exist now and how we manage them — through strong leadership and through engaging the workforce in safety — is crucial in preventing a repeat of that tragedy."

## HSE: KP4 and OSD

The Liverpool-based HSE is a non-departmental public body responsible for the encouragement, regulation and enforcement of workplace health, safety and welfare in England, Wales, and Scotland. In 2010, HSE's Offshore Safety Division (OSD) launched KP4, an inspection program to improve the management of older UK offshore installations, given the growing demands to extend their use beyond the original design life. KP4 will run until December 2013.

On 1 April this year, the 22-year-old OSD was absorbed into a new HSE unit called the Energy Division.

## New Directive

A European Union informal trialogue introduced a new directive on offshore safety and environment.

Initiated after the *Deepwater Horizon* catastrophe in the Gulf of Mexico in 2010, the European Commission, in October 2011, proposed a new regulation for offshore oil and gas activities that would establish minimum environmental, health, and safety requirements for all EU Member States.

In 2012, after strong lobbying from UK North Sea operators, the European Parliament's ITRE Committee voted to change the originally proposed regulation into a directive, which puts more responsibility on the Member States to ensure enforcement of the new safety framework.

Oil & Gas UK, the trade association of the UK offshore oil and gas industry, welcomes the directive, because it preserves the UK's goal-based system operated by the HSE. Robert Paterson, Oil & Gas UK's health, safety and employment director, said the directive "will be the best way to achieve the objective of raising standards across the EU to the high levels already present in the North Sea."

The Department of Energy and Climate Change (DECC) and HSE will transpose the EU directive into UK law.

## North Sea Safety Awards

The International Association of Drilling Contractors (IADC) North Sea Chapter announced its annual safety awards on 10 May in Aberdeen, marking the 40th anniversary of the NSC.

Chapter co-chair Darren Sutherland noted that the Piper Alpha tragedy "initiated a significant overhaul of the North Sea safety regime."

Awards were based on safety performance in 2012, and recognized operators of jackups: Northern Offshore and Ensco; semisubmersibles: Noble Drilling and Stena Drilling; platforms: Archer; and drillships: Stena Drilling. Kvitebjorn and KCA Deutag received Merit Awards for Outstanding Safety Performance over eight years.

In May, Conductor Installation Services, an Acteon company in Great Yarmouth, was recognized for eight years without a lost-time accident, and recieved a Gold Award from the UK Royal Soc. for the Prevention of Accidents (ROSPA). OE

# Meeting challenges

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# ThoughtStream

Igor Sechin, Rosneft President

# Bridge to success is built on partnerships

Rosneft is the largest subsoil licenseholder in the Russian offshore. Total estimated recoverable resources under these licenses exceed 275 billion boe. The exploration program includes drilling 96 wells. I hope that the representatives of Halliburton, Schlumberger, Saipem, Weatherford and other service companies hear my message.

In order to develop such large-scale projects, Rosneft has engaged ExxonMobil, Eni, and Statoil as its strategic partners. Their investments in geological exploration during the first stage will amount to at least $14 billion. We continue to establish new partnerships and expand the existing ones – for example, Rosneft and ExxonMobil have recently extended their partnership in the Arctic with seven additional licenses.

As part of this strategic cooperation, Rosneft and its partners assumed obligations for Russian content of the considerable equipment investments. We started engineering and construction of a drilling platform for Arctic offshore exploration at Russian shipyards using advanced international technologies.

Technologies, experience, and experts are being exchanged. I am glad to announce that during IHS CERAWeek [March 4-8] we signed a deal with ExxonMobil to acquire a 30% stake in the Loki block in the central Gulf of Mexico.

This February, Rosneft signed an agreement with ExxonMobil to enter Point Thompson, offshore Alaska. Last year, we joined the Cardium project in [southern Alberta] Canada.

Our offshore investment decisions will make a provision for anchor orders from other industries. Russia invites the leading suppliers of equipment and oil services providers to participate in the development of the Arctic shelf. It is expected that during the first stage of the offshore development alone, investments will exceed $500 billion–this effect is noticeable even on the global scale.

> "We continue to establish new partnerships and expand the existing ones – for example, Rosneft and ExxonMobil have recently extended their partnership in the Arctic with seven additional licenses."

On our website, www.rosneft.ru, you can find the initial list of equipment, which is required for the exploration stage in the Russian offshore.

Last year marked the beginning of large-scale operations on the Russian Arctic shelf. Rosneft successfully performed an exploration program at our fields in the Kara Sea. As a result of that, and together with our partner ExxonMobil, we selected the Universitetskaya structure to drill in the Kara Sea, where spudding is scheduled for 2014 – a year ahead of the license requirement.

The *West Alpha* semi-submersible drilling platform has been contracted to drill this well. We expect that, based on the drilling results, we should be able to open a new Arctic offshore oil and gas province by the end of 2014. The estimated resource base of this block alone is more than 35 billion boe and the total resources for the Kara Sea are above 100 billion boe.

Rosneft has been, and remains, a reliable partner for international oil and gas companies in Russia and abroad. Over the last year, we have made a breakthrough in establishing strategic partnerships with ExxonMobil, Statoil, ENI, and BP. I would like to take this opportunity to thank the leaders of these companies for their keen approach based on mutual trust.

We are interested in establishing long-term partnerships with leading service and research companies. I believe that only through the joint efforts of companies and national governments to harmonize the regulatory and tax environment can we ensure the sustainable development of global energy markets. OE

***Igor Sechin*** *has served as president of Rosneft and chairman of its management board since May 2012. He previously served as chairman of the board of directors from 2004-2011.*

## FURTHER **READING**

**Full text of CERAWeek speech:**
http://www.rosneft.com/attach/0/02/99/cera_speech_en.pdf


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# Global Briefs


### A ConocoPhillips

paused its 2014 Alaska Chukchi Sea drilling program, saying it would not be practical to make monetary commitments given uncertainties of evolving federal regulatory requirements and operational permitting standards.

### B Julia field to be developed

ExxonMobil and Statoil (50% each) will develop Julia oil field, 265 miles southwest of New Orleans in the Walker Ridge area of the US Gulf of Mexico. Initial development will be designed to produce 34,000 bo/d, Exxon said. Capital costs could be more than US$4 billion.

### C Shell to develop Stones project

Royal Dutch Shell plc will develop the Stones ultra-deepwater project in 9,500ft of water, about 200mi southwest of New Orleans. Development will start with two subsea wells tied back to an FPSO, followed by six additional wells. This first phase is expected to reach peak production of 50,000 boe/d.

### D Brazil enjoys licensing success

ANP, Brazil's National Petroleum Agency, announced the winners of its 11th licensing round. There were 289 blocks (150,000 sq km) up for bid. Thirty high bids were accepted, about US$1.4 billion in revenue, ANP said. Total offered the highest bid for a single block, US$171.4 million (R$345.950 million), for Block FZA-M-57, in the Foz do Amazonas Basin. Total (40%) will operate with partners Petrobras (30%) and EOC BP (30%).

### E Petrobras discovery

Petrobras discovered good-quality oil (26° API) in the Entorno de Iara area in the Santos Basin pre-salt region. Well 1-BRSA-1146-RJS (1-RJS-711), known as Entorno de Iara 1, is in 2266m of water, 235km off Rio de Janeiro state. The well produced oil from carbonates at 5045m, just below the salt.


### F FOGL to drill

Falkland Oil & Gas (FOGL) will continue its 3D seismic acquisition campaign and target exploration drilling in the second half of 2013. A 1,000sq km survey over a Cretaceous fault block area is underway and a large 3D survey in the Northern Licence Area is planned for 4Q 2013. FOGL said it would be defining targets for exploration drilling during 2H 2013.

### G New Gullfaks reserves

Statoil and Petoro have proven additional resources in the Shetland Group/Lista formation in the Gullfaks licence. Production well 34/10-A-8 on the Gullfaks A platform where the well test is was done, currently provides a production of 7,500b/d. Preliminary calculations indicate 40-150MMboe of recoverable reserves. Statoil (70%) operates the field with partner Petoro (30%).

### H Fairfield shots 3D

Fairfield Energy began a 400sq km Broadband 3D seismic survey over Block 43/28, using the *Polarcus Nadia*.

### I Energean explores Greece

Energean Oil & Gas plans to increase its exploration and production offshore Greece. The firm received $60 million from the newly-created Third Point Hellenic Recovery Fund. The cash will fund a four-well program in 2013 with the goal

## Contract Briefs

### Technip awarded flowline work

Husky Oil Operations awarded Technip two contracts for the planned subsea tieback of the South White Rose Extension field off Newfoundland and Labrador in the Jeanne d'Arc basin. Contracts include gas injection flowlines, umbilicals, and subsea structures.

### Saipem wins installation work

Saipem was awarded new contracts in Latin America worth about US$500 million. In Venezuela, Saipem signed with Cardon IV to develop the Perla EP Project, in the Gulf of Venezuela.

In Brazil, Petrobras assigned an EPCI contract to Saipem for the Sapinhoa Norte and Iracema Sul Projects in the Santos Basin, 300km off Rio de Janeiro state.

### Noble to drill at Mariner

Noble Corp. was awarded a four-year drilling contract from Statoil for work on the UK North Sea Mariner project using a new Cat J jackup. The contract is worth $655 million and includes a two-year option. Work will start in 2016.

### Boskalis awarded Philippines work

Shell Philippines Exploration B.V. awarded Royal Boskalis Westminster N.V. a contract to install a Depletion Compression Platform for the Malampaya Project off the coast of Palawan Island, in The Philippines. The contract value is about US$60 million; to run early-late 2014.

of doubling production to 4000b/d by year end. It will also help start the Epsilon development plan, a 32MMbbl satellite field to the Prinos field.

### J Noble discovers gas

Noble Energy found "significant signs of gas" in the Karish 1 well 75km northwest of Haifi in Israeli waters, according to partners. Delek Group said that 60ft of natural gas bearing sands were found after drilling reached 4790m below sea level in license area Alon C/366.

### K Petroceltic and Edison gain acreage

Petroceltic International is participating in a joint venture with Edison International Spa, which was the successful bidder for two blocks, North Thekah and South Idku, in the Egyptian Natural Gas Holding Co. 2012 International Bid Round.

North Thekah (Block 7) is located off the Nile Delta. South Idku (Block 1) is onshore in the Nile delta.

### L Farmout of OPL 310

Afren farmed-out 17.14% interest in the OPL 310 license off Nigeria to Lekoil (subject to Nigerian Ministerial consent). Optimum Petroleum Development Ltd. (60%) will operate with partners Afren (22.86%) and Lekoil (17.14%). The first exploration well will be drilled on the Ogo prospect, targeting 78MMboe, and will include a sidetrack, targeting 124MMboe.

### M Mozambique discovery Eni

found gas in the Mamba South 3 well, which was drilled in 1571m of water to 4948m TD. The well is in Area 4 about 50km off the Cabo Delgado coast. The well opened 214m of gas pay in Oligocene and Eocene reservoirs.

### N Tanzania discovery

BG Group completed a second drill stem test in Block 1 off Tanzania. The test was in the Mzia-2 well and flowed at a maximum rate of 57MMcfd. This is the first test of a Cretaceous reservoir in Tanzania's deep water. Mzia-2 is 4km from the Mzia-1 discovery, in 1620m of water about 45km off the coast of southern Tanzania.

### O Tanzania licensing round

Tanzania Petroleum Development Corporation (TPDC) announced the 4th Tanzania Deep Offshore and North Lake Tanganyika Licensing Round. The round will launch on Oct. 25, 2013, during the 2nd Tanzania Oil and Gas Conference, and Exhibition (23-25 October 2013 in Dar es Salaam) and close on May 15, 2014. It includes seven deepwater blocks averaging 3000sq km in water 2000m-3000m deep.

### P IVB opens Abu Dhabi office

Growth by Inspection Verification Bureau Ltd. (IVB) has prompted it to open a new office in Abu Dhabi and set up a joint enterprise in Kuwait. IVB will open an office with two staff, but has plans to expand the office to as many as 12 employees.

### Q Rosneft, Marubeni sign E&P pact

Rosneft and Marubeni Corp. signed a memorandum of cooperation for an LNG project and joint exploration and development (E&D) of oil and gas fields. It includes engineering and construction, financing, LNG transport (tanker operation, equipment and machinery supply), and LNG marketing to Japanese utilities.

### R Viking Offshore opens R&D center

Viking Offshore & Marine Ltd. will invest up to S$15 million to set up a dedicated innovation hub in Singapore.The center will be an enterprise hub for companies, and will combine research and development, collaboration, innovation, technology test-bedding, and incubation of new concepts, including clustering some companies into product groups to prepare them for the market.

### S AWE discovery

AWE Ltd. reported a second successful drillstem test (DST) at the Lengo-2 appraisal well 25 miles north-northwest of Tuban, Indonesia, with a maximum gas flow rate of 21.2 MMcfd. Gas samples were gathered for analysis. Partners in the Bulu PSC are: KrisEnergy Satria Limited (operator) 2.5%, AWE Ltd. (via subsidiaries) 42.5%, PT. Satria Energindo 10.0%, and PT. Satria Wijaya Kusuma 5.0%.

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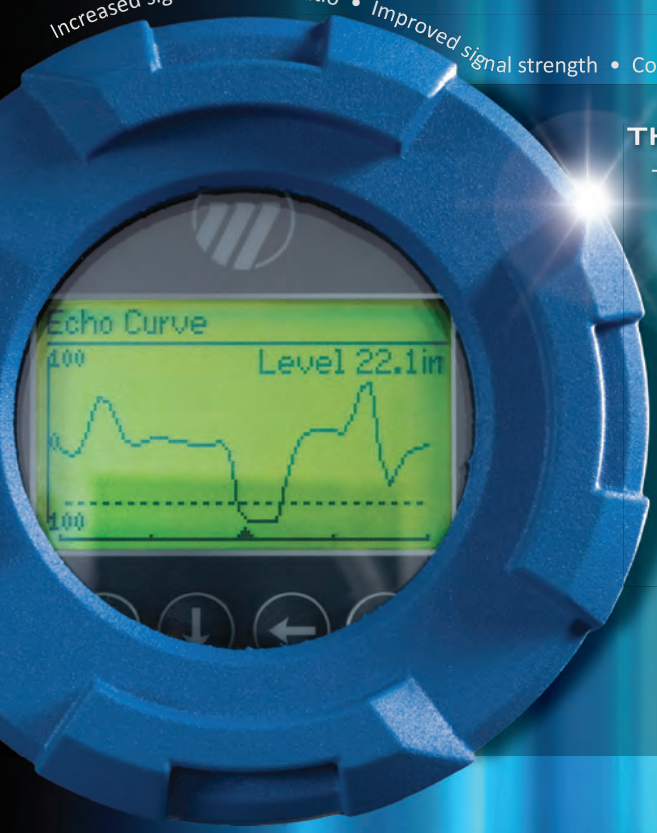


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# Analysis

# Progress after Piper

**As the 25th anniversary of the UK North Sea Piper Alpha disaster approaches, GL Noble Denton looks at regulatory best practice.**

The 25-year anniversary of the Piper Alpha disaster provides an important opportunity to stop and reflect on the progress made by oil and gas companies and regulatory regimes on safety and integrity. But we all need to remain vigilant if we are to continue to mitigate the risks of future such disasters.

The anniversary of the Piper Alpha catastrophe in the North Sea provides a poignant reminder of just how far the oil and gas industry has come in the last 25 years. It also reminds us how potentially catastrophic it can be for companies across the oil and gas supply chain if their safety and risk management processes do not operate effectively.

In our industry, the difference between a near miss and a serious incident can often be minimal. A simple oversight or error, or a gradual habituation to a minor fault can feel less harmful the longer it is tolerated. Seemingly inconsequential factors can set off a catastrophic chain of events, as seen at Piper Alpha in 1988, at the Buncefield oil storage facility—where a fuel leak, in 2005, resulted in the largest explosion that the UK has seen in its peacetime history—and at Macondo in 2010.

The challenge for oil and gas companies and their regulators lies in recognizing where the risks lie, and creating and effectively operating systems that manage those risks.

## Learning from past catastrophes

Regulations put in place after the Piper Alpha disaster have helped the industry build a stronger safety culture. This includes the UK requirement for operators to demonstrate that they are taking measures to manage hazards and reduce risks to become as low as reasonably practicable (ALARP) and the role played by the UK Health and Safety Executive in enforcing (and updating) the Safety Case regulations.

**Piper Alpha memorial, designed and sculpted in bronze by Sue Jane Taylor, and installed in Hazlehead Park, Aberdeen in 1991.**

While there is much in which to find merit in the UK's regulatory regime, the anniversary of the Piper Alpha disaster, as well as more recent incidents, reminds us once again of the need to examine whether the regulations are still fit for purpose, and if they are able to evolve with the industry's changing needs, technologies, and practices.

There are hard lessons learned from such disasters. While the US drastically revised its regulatory regime in the wake of the Macondo disaster, would it have made a difference had it amended its approach sooner? Although there is no definitive answer to this question, the likelihood of such an event would probably have been reduced.

The source of a disaster can be a long-term degradation of equipment or a short-term oversight (e.g. shortcuts made in the face of time pressure). An incident is often enabled by a lapse in safety management; for example, a risk management process that gradually, over time, becomes less effective due a human willingness to attempt, or accept, shortcuts.

The roots of the Macondo disaster are very different, yet there are parallels to be found to Piper Alpha in the health and safety culture and working practices that allowed the causes of the incident to be missed until it became too late.

## Reactions to US regulatory change

In April 2013, GL Noble Denton set out to measure industry reaction to recent changes in the US regulatory regime. The resulting report, *Reinventing Regulation: The impact of US reform on the oil and gas industry*, reveals how tough the oil and gas regulatory landscape has become in the US, post-Macondo, according to oil and gas professionals operating there. An overwhelming majority (85%) said that they expect the US regulatory regime to get tougher in the coming two years, on top of the changes

# Quick stats

*OE*'s at-a-glance guide to offshore hydrocarbon reserves and key offshore infrastructure globally is updated monthly using data from leading energy analysts Infield Systems (www.infield.com).

## New discoveries announced

| Depth range | 2010 | 2011 | 2012 | 2013 |
|---|---|---|---|---|
| Shallow (<500m) | 92 | 103 | 72 | 11 |
| Deep (500-1500m) | 28 | 25 | 23 | 4 |
| Ultradeep (>1500m) | 30 | 20 | 34 | 8 |
| **Total** | **150** | **148** | **129** | **23** |

*Note: Operators do not announce discovery dates at the time of discovery, so totals for previous years continue to change.*

## Reserves in the Golden Triangle

by water depth 2013-17

| Water depth | Field numbers | Liquid reserves (mmbbl) | Gas reserves (bcf) |
|---|---|---|---|
| **Brazil** | | | |
| Shallow | 25 | 3,236.75 | 1,680.00 |
| Deep | 16 | 3,257.00 | 2,555.00 |
| Ultradeep | 40 | 12,428,45 | 17,340.00 |
| **United States** | | | |
| Shallow | 21 | 96.45 | 1,253.50 |
| Deep | 26 | 1,898.71 | 2,124.87 |
| Ultradeep | 24 | 2,925.00 | 3,340.00 |
| **West Africa** | | | |
| Shallow | 150 | 3,378.60 | 18,217.81 |
| Deep | 47 | 5,574.00 | 6,420.00 |
| Ultradeep | 16 | 2,540.00 | 3,000.00 |
| **Total** (last month) | **365** (372) | **35,334.96** (37,966.37) | **54,631.18** (54,592.09) |

## Greenfield reserves

2013-17

| Water depth | Field numbers | Liquid reserves (mmbbl) | Gas reserves (bcf) |
|---|---|---|---|
| Shallow (last month) | 1,349 (1358) | 78,930.66 (79,677.08) | 837,296.39 (840,869.86) |
| Deep (last month) | 171 (172) | 14,524.58 (15,008.74) | 87,046.57 (87,092.48) |
| Ultradeep (last month) | 99 (104) | 18,322.45 (20,438.20) | 67,197.00 (65,907.00) |
| **Total** | **1,619** | **111,777.69** | **991,539.96** |

## Pipelines

(operational and 2013 onwards)

| | (km) | (last month) |
|---|---|---|
| **<8in** | | |
| Operational/ installed | 42,633 | (42,570) |
| Planned/ possible | 23,170 | (22,133) |
| | **65,803** | (64,703) |
| **8-16in** | | |
| Operational/ installed | 77,886 | (77,929) |
| Planned/ possible | 47,482 | (47,240) |
| | **125,368** | (125,169) |
| **>16in** | | |
| Operational/ installed | 88,353 | (88,308) |
| Planned/ possible | 47,758 | (47,362) |
| | **136,111** | (135,670) |

## Production systems worldwide

(operational and 2013 onwards)

| **Floaters** | | (last month) |
|---|---|---|
| Operational | 274 | (272) |
| Under development | 46 | (47) |
| Planned/possible | 315 | (320) |
| | **635** | (639) |
| **Fixed platforms** | | |
| Operational | 9,878 | (9,876) |
| Under development | 148 | (141) |
| Planned/possible | 1,467 | (1,438) |
| | **11,493** | (11,455) |
| **Subsea wells** | | |
| Operational | 4,426 | (4,420) |
| Under development | 393 | (387) |
| Planned/possible | 5,981 | (5,959) |
| | **10,800** | (10,766) |

## Global offshore reserves (mmboe) onstream by water depth

| | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|
| Shallow (last month) | 10,429.53 (10,431.06) | 6,125.23 (6,255.23) | 65,466.32 (68,939.80) | 34,157.68 (31,391.27) | 41,087.23 (41,138.09) | 31,629.57 (32,272.94) | 54,574.12 (54,548.99) |
| Deep (last month) | 1,316.73 (1,316.73) | 2,533.96 (2,533.96) | 3,652.02 (3,667.02) | 5,830.40 (5,825.60) | 3,968.34 (4,378.91) | 5,424.56 (5,422.71) | 10,996.57 (11,059.66) |
| Ultradeep (last month) | 199.94 (199.94) | 797.15 (797.15) | 3,090.44 (3,180.44) | 3,075.06 (3,123.81) | 1,948.73 (2,432.20) | 5,949.75 (6,877.27) | 16,114.35 (16,452.93) |
| **Total** | **11,946.21** | **9,396.34** | **72,208.78** | **43,063.14** | **47,004.30** | **43,003.88** | **81,685.04** |

15 May 2013

already implemented.

The research shows that the industry, in general, favors a goal-setting regulatory regime, in which the regulator defines the goals that have to be achieved and operators are free to decide how to achieve them. This type of regime is active in the North Sea, and was introduced to the UK's oil and gas industry in reaction to the Piper Alpha incident. Of the respondents, 76% said that a goal-setting regulatory regime was most effective in improving safety performance. There has typically been a more prescriptive approach taken in the US.

The danger with a prescriptive system is that an operator is able to act within the letter of the regulations and then stop, having "fulfilled" its duty. In the UK and many other regimes, in contrast, the onus is on the operator to think through its own challenges and issues, and to demonstrate that it has understood the risks and acted accordingly.

It is due, in part, to the goal-setting approach that UK regulation has worked since Piper Alpha. By placing the emphasis on the operator to recognize and meet its ALARP goals, and with such a goal not being an absolute, the operator needs to constantly strive to reduce risk. Regulations remain applicable even as oil and gas industry practices, technologies, and operating environments evolve.

In the North Sea, for example, a number of changes have occurred to the commercial arrangements under which platforms are operated, since the UK regulations were drafted. Many platforms are operating beyond their original design life expectancies. New projects and tie-backs place new demands on existing infrastructure. However, the largest risks still relate to the integrity of assets and the shrinking levels of production that are there to support them. The goal-setting regime in the UK has been able to cope with these changes over the last 20 years, with only minor amendments, and this has helped the UK industry benefit from improved safety performance.

### Learning from goal-setting regimes

Unlike goal-based regulation, a prescriptive approach is not able to evolve in with industry practices and is not able to guard against future disasters. New technology that was not envisaged when the regulations were written could fail, with tragic results. This can make industry professionals question the regime under which they are working and its ability to guard against major disasters.

For this reason, many countries look to goal-setting regimes—such as those of Norway and the UK—when establishing their own regulatory framework. GL Noble Denton is currently working with governments across Europe and the Middle East to help create new goal-setting legislation for their oil and gas industries.

In Ireland, we have been working with the Irish Commission for Energy Regulation (CER) to introduce new upstream safety regulations that cover onshore and offshore production. A team of safety and regulatory specialists has been working with the CER for a number of years to review different regulatory approaches being used around the world, to identify the ones most suitable for the Irish

industry, and taking practices from the UK and Norway, among others, to develop local regulations.

In many ways, the Irish Commission is fortunate to have the time and freedom to analyze and evaluate regimes across the globe. That might not be possible were the regime being introduced in reaction to a major catastrophe.

Ireland isn't the only country re-examining its approaches to regulation. All regulators will—or should—be constantly looking at what is going on elsewhere and seeing what they might be able to learn from approaches being adopted in other countries.

Change is likely to ripple out from the US regulatory changes, too. In *Reinventing Regulation*, industry professionals predict that the repercussions of US regulatory tightening will go well beyond the Gulf of Mexico. Six in 10 of those polled expect the current regulatory trends within the US to have implications for regimes elsewhere.

### Looking forward by remembering the past

Piper Alpha taught us that a catastrophic chain of events can occur from any combination of issues or oversights. Many technical issues can be accounted for by putting systems in place to alert operators to degradation of aging assets or sudden faults. The challenge comes in ensuring that regulation remains current and live, so that operators are constantly challenging the processes that they use and regulators are taking a firm hand in assessing them in this.

Regulation will help improve industry practices but it's just as important to focus our efforts on education. We should remember catastrophic incidents such as Piper Alpha and Macondo and the impact they had on people and the environment. Those lessons should instill a safety culture that upholds the importance of risk management processes and reminds us of the dangers of complacency and deviation from them.

Download a complimentary copy of *Reinventing Regulation* from: www.gl-nobledenton.com OE

***John Morgan*** *is head of consulting and compliance for GL Noble Denton's UK safety and risk practice. Based in Aberdeen, he is responsible for compliance, technical assurance and safety consultancy operations. In recent years, he has worked alongside a number of national government authorities to help them establish and optimize their regulatory regimes. He earned a PhD in Applied Mathematics from Oxford University.*

***Mike Johnson*** *is principal consultant for GL Noble Denton's UK safety and risk practice. Based in Loughborough, UK, he has spent much of his career studying the cause and effects of major accident hazards around the world. This has included leading full-scale explosion research and other experimental studies conducted following the Piper Alpha disaster. Most recently, he has been involved in investigating vapor cloud explosions in Buncefield, UK, and Jaipur, India. He earned an MA in Mathematics at the University of Cambridge.*

# G & G Notebook

Andrew McBarnet

# Gravity gradiometry has graduated!

**Andrew McBarnet** picks up on the growing enthusiasm for modern gravity gradiometry surveys to assist E&P oil and gas operations

There's definitely something stirring in the full-tensor gravity gradiometry (FTG) market for airborne and vessel surveys over onshore and offshore targets, based on significant advances in gravity measurement for E&P developed in the last 15 or so years. Much of the recent high-profile activity has centered on supporting oil company early reconnaissance of prospects in East Africa, where identification of unsuspected new hydrocarbon plays has taken the industry completely by surprise.

In this context, FTG is increasingly recognized as a valuable method to survey large areas of exploration interest where there is little or no seismic data available and where large-scale seismic surveys may be impractical because of the type and size of the terrain.

According to ARKeX, UK-based provider of FTG services, East African geology, essentially comprising relatively young sediments juxtaposed against a (much denser) Archaean basement, was ideally suited for gravity gradiometry technology. Operators (Tullow, Africa Oil) have acquired large FTG surveys over Kenyan and southern Ethiopian holdings to assist their exploration activities. FTG is used to measure variations of the Earth's gravity field with such a high degree of resolution and bandwidth that detailed basement structure maps can be derived. This facilitates optimal positioning of a seismic campaign, according to ARKeX. As an airborne technique, FTG surveys can be acquired efficiently and rapidly over large areas with the additional benefit of a negligible environmental footprint. Further down the line, early seismic acquired in a basin can be calibrated to the FTG data and if necessary, the seismic program can be modified to take account of shallow basement or insufficient depth of burial of potential source rocks.

Offshore Mozambique, ENI and Anadarko have been leading the charge with substantial gas discoveries. In 2011, the Instituto Nacional de Petróle (INP), which manages the country's oil and gas resources, announced tenders for seismic and FTG multi-client surveys. In April 2013, WesternGeco, winner of the main seismic tenders, began a 2D, long-offset, multi-client survey of more than 31,000km. This covers most of Mozambique's offshore territory, where future licensing rounds are expected. ARKeX was chosen to carry out the FTG multi-client campaign, beginning with a planned survey over the Beira High, but a start date has not yet been announced. The company has also been in the bidding fray for a similar government-inspired project off Sri Lanka.

High-resolution, high-bandwidth FTG surveys are applicable not only to these frontier exploration areas, but have also been used in areas dominated by complex salt structures. For example, ARKeX has carried out both marine and airborne FTG surveys

**Lockheed Martin design full tensor gravity gradiometer and control cabinet.**

off- and onshore West Africa to provide valuable control data for mapping salt structures and thereby aiding the seismic interpretation. Ophir, Svenska, CGGVeritas, and Maurel et Prom have all acquired FTG surveys to aid their seismic interpretation and imaging. In these cases, density contrasts resulting from salt emplacements in denser surrounding sediments and carbonates create large signals in the FTG data that can aid the interpretation of seismic often characterized by low acoustic impedances. In the Red Sea, an ARKeX marine FTG survey in three blocks off the western coast of Saudi Arabia were intended to improve the definition of the top and flanks of salt bodies within the survey area. The FTG data was able to enhance geological and velocity model building, and to improve overall 3D seismic imaging, the company says.

There are plenty of other clues suggesting the technology is gaining traction in the oil and gas industry, including a surge of meetings and research papers over the last few years, many focused on data modelling and improved integration with other E&P data. A more practical indication is that CGG has shown every sign of being excited by its acquisition of Fugro Airborne Surveys (still to be officially signed off). This unit, which has an ongoing FTG operation, was included in the package when CGG bought the Fugro geoscience division earlier this year: word from CGG is that it only sold off its airborne geophysical services 13 years ago (to Fugro) because of belt tightening during the 1999–2000 seismic market downturn.

For oil and gas operations, CGG may be looking with interest at a joint project undertaken by ION Geophysical and ARKeX offshore northeast Greenland as a potential model for its own multi-client activities in the future. The idea was to integrate a 2D seismic GreenlandSPAN survey carried out by ION with ARKeX FTG data to create a 3D structural model of the northeast Greenland passive margin.

In August last year, ARKeX completed the FTG segment, offshore northeast Greenland. The 50,000sq km, multi-client survey for ION is said to have been the largest single offshore FTG survey ever undertaken. It actually had to be flown by Bell Geospace because it was the only company with a plane suitable for the long-distance flights required. The survey included key areas of the pre-round blocks that are on offer initially to the KANUMAS group and then in the ordinary licensing round this year offshore Greenland. The FTG data has been integrated and jointly interpreted with ION's 2D data to provide a better understanding of the structural development of the region.

ARKeX plane takes off on FTG mission.

In its strategy going forward from the Fugro purchase, CGG is known to be thinking of a more aggressive approach to multi-client survey work. It makes sense that it should be contemplating projects that can integrate gradiometry surveys with seismic datasets. Such a strategy also conforms to CGG's new positioning as the only 'integrated geoscience company' offering a complete portfolio of geophysical applications, seismic and non-seismic.

The company has the FTG tools because it is inheriting the Falcon Airborne Gravity Gradiometer (AGG) system, employed by Fugro Airborne Surveys. Falcon systems have clocked up over 2 million survey-line km worldwide, mainly but not exclusively for mineral exploration, either for direct resource detection or geological mapping.

The Falcon story is part of industry folklore about how FTG came into commercial use. During the 1970s, as an executive in the US Department of Defense, John Brett is said to have initiated the development of the gravity gradiometer to support the Trident 2 submarine system. It would be the first gradiometer that could work on a moving platform. A full FTG system was deployed on US Navy Ohio-class Trident submarines designed ostensibly for covert navigation, but most probably also for the passive detection of gravity field changes that might indicate the presence of a silent enemy submarine. The movie "The Hunt for Red October" alluded to the technology. Whatever the purpose, the FTG system was developed by Bell Aerospace, Niagara Falls, NY (later acquired by Lockheed Martin). With the end of the Cold War, the US Navy released the classified technology and opened the door to full commercialization.

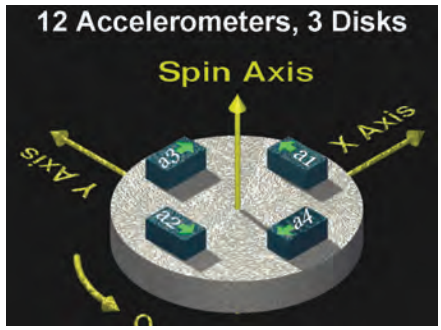
Lockheed Martin's research included an airborne test, in 1986, of the FTG system called the Gravity Gradiometer Survey System (GGSS). While the GGSS did measure real gravity gradients, the noise levels were high. Mark Dransfield of BHP Billiton recalled at a 2007 mining conference that the test was performed using a system mounted in a Winnebago, which was driven into a Hercules C-130 – possibly

not an ideal solution.

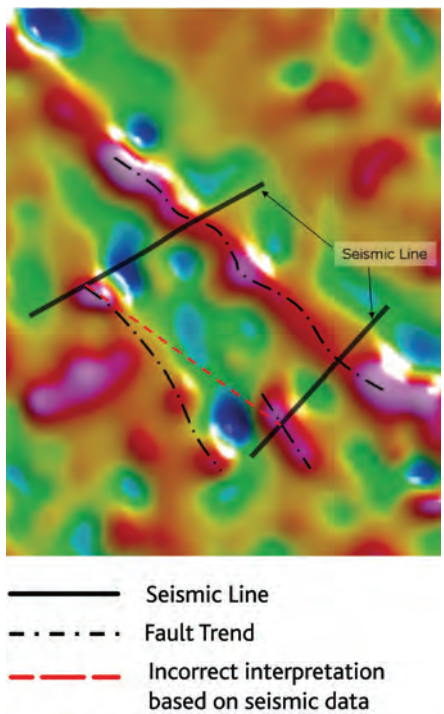
In 1996, BHP (now BHP Billiton) entered into an agreement with Lockheed Martin to develop a new gravity gradiometer. However, it was based on a technology, newer than the GGSS FTG, developed by Lockheed Martin for an arms verification application. This emerged in the industry as the Falcon AGG, initially operated by BHP Billiton with its mining interests in mind. In October 1999, the first airborne gravity gradiometry survey was flown over the Bathurst Camp in New Brunswick by Sander Geophysics for BHP Billiton. The Falcon technology was subsequently acquired, in 2007, by Fugro Airborne Surveys. It is a partial tensor system with eight accelerometers and can be deployed in a fixed wing aircraft or a helicopter.

During the 1990s, Bell Geospace independently developed the first marine FTG system using technology also licensed from Lockheed Martin. Those with long memories may recall the razzmatazz that greeted the first surveys. It was eerily similar to the hype that was to greet that other potential methods breakthrough, marine control source electromagnetics (CSEM), just a year or two later. Like the early CSEM operators, Bell Geospace was to experience the dazzling debut followed by a period of doubt, disillusion and financial challenges before redemption for the technology in the form of gradual industry adoption as a mainstream survey option. Between 1998 and 2002 the company focused on surveys in the Gulf of Mexico and northwest Europe, using two Marine-FTG units (equipment costing millions of dollars) mounted on dedicated vessels.

The main interest at that time was the imaging of salt and basalt features. Gradient data responds to density changes independently of velocity and is not subject to imaging problems caused by the scattering of seismic energy. According to Bell Geospace, FTG technology therefore provided an independent means to resolve subsurface structure by defining the size, shape and thickness of salt and subsalt structure. A well-defined salt feature can be used to provide a more accurate initial velocity model for prestack depth migration, thereby saving




**How full gravity gradiometry works.**




**FTG surveys use accelerometers to measure gravity's rate of change in three directions.**

iterations, time and money. Gradient data also responds strongly to the presence of basalt. The size, shape and thickness of basalt can be mapped and its signature removed from the seismic data in order to accurately image the sub-basalt structure.

By 1993, Bell Geospace had modified its systems so that it could offer either marine or airborne FTG surveys. In 2005, ARKeX was established by ARK Geophysics and Oxford Instruments based in Cambridge, UK. The idea was to develop and operate the superconducting gravity gradiometer technology being researched and developed by Oxford Instruments. However, the company's first step was to enter the FTG market with systems similar to the Bell Geospace equipment built by Lockheed Martin capable of both marine and airborne operation.

Technically, the benefit of the FTG survey arises from using multiple pairs of accelerometers to measure the rate of change of the gravity field in all three directions while a conventional gravity survey records a single component of the three-component gravitational force, usually in the vertical plane. In other words, gravity gradiometers capture the high-frequency signal associated with near-surface lateral density variations more clearly than conventional vertical gravity field instruments. This is explained by the fact that the gradiometer signal strength falls off with the cube of the distance to the target while the conventional vertical gravity signal decays with the square of the distance.

Naturally, the clock has not stopped on the development of more sophisticated FTG survey technology, driven by the desire for increased precision as well as more efficient, less costly operations, but constrained by the stable platform and controlled speed required for the current survey methods. ARKeX recently opened a special test center to accelerate development of its Exploration Gravity Gradiometer (EGG), originally associated with a European Space Agency mission, and now being targeted for high dynamic survey environments. The company says it uses two key principles of super conductivity to deliver its performance: the "Meissner effect," which provides levitation of the EGG proof masses and "flux quantization," which gives the EGG its inherent stability. The EGG is designed to operate at 40° above absolute zero (-269°C). This is said to allow greater sensitivity and stability.

Other projects ongoing or reported are the Stanford University Atomic Interferometer (AI) Gravity Gradiometer; Gedex High-Definition Airborne Gravity Gradiometer; University of Western Australia (UWA) Gravity Gradiometer; and the Gravitec Ribbon Sensor. You can also be sure that current operators Bell Geospace and CGG will be continuing to assess the effectiveness of their technology. This is a market that seems destined to grow in scale and scope. **OE**

# EXCLUSIVE RESEARCH

## Deepwater Intervention

### Technology Needs Assessment 2013

The 2013 Deepwater Intervention Technology Needs Assessment, a research study done in partnership with Gelb Research, is a 55-page report providing an in depth assessment of the subsea industry's present condition and its known needs. Technical needs were assessed based on water depth, reservoir depth, metaocean conditions, and service/supply for all the major deepwater regions. Technical challenges were prioritized based on economics, risk, strategy, and frequency. The evaluation led to an overall value rating for the topics examined, which included: intervention incidence, intervention triggers, intervention solutions, and flow assurance methods. Cost $895.00

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OE ATCOmedia PUBLICATION

Gelb An Endeavor Management Company

# Dutch develop dual MPT for new drillships

**European editor Elaine Maslin went to visit Huisman's yard in Schiedam, Netherlands, as the finishing touches were being carried out on the *Noble Globetrotter II.***

When offshore lifting, pipelay and drilling firm Huisman decided to redesign the traditional derrick tower on mobile drilling units, it decided to go back to basics—and redesign the whole unit.

Huisman has come up with a vessel layout using a dual, multipurpose drilling tower, allowing the drill floor to be placed about five meters above deck level, lowering the overall center of gravity, increasing stability, reducing vessel size, and therefore reducing costs while increasing deck space.

The latest result, vessel number two, of this work will soon start its voyage to offshore Benin, Africa, to drill for supermajor Shell.

It is the 189m long, 32m wide Noble *Globetrotter II (GT2),* the second of two Huisman-designed drillships based on the HuisDrill 12000 design built for Noble Drilling and both on contract to Shell.

The *Globetrotter I (GT1)*, commissioned in 2011, went into service in 2012 and has been drilling for Shell in the Gulf of Mexico.

Joop Roodenburg, chief executive of Huisman, said feedback had been good, with strong uptime. Of the overall downtime less than 2% was attributed to Huisman equipment, he said.

The HuisDrill design is a DP3 drillship. It can conduct drilling operations in water depths up to 12,000ft deep, install Xmas trees, and perform well testing.

The *GTs* have two ROVs, a service speed of 12kts, 54,000 tons displacement, 20,000 ton payload, and accommodation for 180 in single and twin cabins. Power is from eight 4.6MW engines, with six 3.7MW thrusters.

Central to the HuisDrill is the

**The *Noble Globetrotter II* at Schiedam.**


**The *Noble Globetrotter II*'s hoistable construction floor.**

61m-high, dual multipurpose drilling tower (DMPT) with two 1090-ton capacity hoist systems on either side, one above the well center in the drill floor and the other above the center in the construction floor. The construction side is for 135ft stand building, the handling of large subsea structures, the BOP, and running risers, which can be while drilling the surface hole.

The construction floor can be hoisted in order to skid the BOP or Xmas tree underneath and positioned before lowering into the moonpool. This means the construction floor, and consequently the drill floor, can be low, reducing the center of gravity and minimizing lifting activities.

Due to the lowered tower and drill floor, an exhaust outlet could be placed above a forward accommodation block, the engine rooms could be moved forward of the tower, creating space for up to 9900ft of risers (3000 tons worth) in a hold, and opening deck space covered by a gantry crane.

According to Huisman, these improvements have led to a vessel that is 50% smaller than a conventional drillship, but with the same capacity. It also means it is Panamax size and, thanks to a removable section at the top of the DMPT, it can fit through the Panama canal, the Suez, and also under the Bosphorus' bridge.

The design idea started when Huisman carried out work on the *Pride Amethyst 2* Class semisubmersible rigs, 1995-1998. Huisman was not providing the tower at this stage, but, looking at the interface between the derrick and the vessel, Huisman questioned the point loads created by the derrick's four legs. This resulted in the idea for a different type of tower to interface and spread load on the vessel better.

The first, a multipurpose tower (MPT), was built in 2000 to go on Helix Energy's Q4000 well intervention semisubmersible, delivered in 2001. The use of an MPT instead of a traditional drill-derrick structure with its limiting "V-doors," meant different drilling packages could be skidded in, enabling flexible use.

Then, in 2007, Huisman was contracted to work with Frontier Drilling and Shell to design its first DMPT and related pipe, riser and BOP handling equipment for Frontier's first drillship, the *Bully I* (now working in the Gulf of Mexico) and then a year later for a second ship, the *Bully II* (working off Brazil).

"Shell wanted to not go in with a bigger hammer, but see how it could be done smarter, Shell's vision was not to use a bigger hammer, but to find a way smarter way," said Roodenburg.

Both *Bully* vessels had already been designed (by GustoMSC) with a view to have traditional derricks when Huisman was brought in, which meant retrofitting the tower into the design.

"This was the start," said Roodenburg. "That gave us the chance to put up our tower and we then saw an opportunity to challenge the whole vessel design using the thinking we had started on the semis, with our tower as the center point."

Work on the HuisDrill design then started, with Noble Drilling becoming involved ahead of taking over Frontier, in 2011, while the Bully vessels were


**The evolution of Huisman's drilling tower design, from the existing point load derrick to a tower design.**


**The *Noble Globetrotter II* has a large moonpool, over which the BOP is skidded and lowered.**

still being completed in Singapore.

"Together we constructed this drillship," said Roodenburg. "We used what we had learned on the semis and then worked the ship around it. We always start from a white sheet of paper; that is what we do."

The *GT2*'s hull was built at STX Dalian's yard in China, sailed to Schiedam for fitting out of the topsides equipment last year and completed in March.

Key has been challenging the handling principles and lowering the drilling floor.

"Lowering the floor gives you much more payload capacity, at 20,000 tons on HuisDrill compared to 12,000 tons on the *Bully*," said Roodenburg. "That is a big difference—because of an integrated design. The tower is easier to integrate, the footprint and load spreading is much easier to integrate on to a hull."

The smaller size of the vessel reduces its construction cost by $50-$100 million, said Roodenburg. It also has a lower environmental footprint, lower maintenance, and can be built in various yards.

But having built a small vessel, Huisman is now considering going bigger and introducing full automation.

Huisman is considering extending the vessel length by 10m so it can handle 150ft lengths of risers, said Precious Nwokoma, drilling engineer at Huisman.

"When you run risers in 3000m water depth at 75ft long, it can take about three to four days," he said. "The idea is to handle 150ft risers and run them. For that we need extra length in the vessel. It would reduce running time by half."

While there are no immediate orders for the next HuisDrill, there is interest, says Roodenburg. "We are talking to various potential clients now," he said. "Major clients and drilling contractors have been on board. All like what they see."

The *Noble Globetrotter I* is working for Shell in the Gulf of Mexico.

The *Noble Globetrotter II* was due to go out on sea trials at the end of April and will be undergoing mobilization before heading to Benin. Following a period there for Shell, it is then potentially going to work in the Black Sea in 2014, also for Shell. OE

**Looking up at the dual hoists flanking the multi-purpose drilling tower on the *Noble Globetrotter*.**

## Design detail - Huisman's dual multipurpose tower

The GTI and 2s' DMPTs ease construction and interface with the vessel because they can be built in Huisman's Schiedam fabrication hall and then skidded on the quayside, where it can be tested, before a single lift onto the vessel, says Huisman.

Each DMPT has dual drum drawworks with a winch at either side of the drill lines, which means should one winch fail, the other can still operate the travelling block at full load. The two blocks are also splittable (under patent), with push-button reeving change to increase block speed under light loads. Both well centers can also operate from the two setback drums, which means the system can still operate if one pipe racker fails.

Stands of pipe at 135ft formed from three 45ft sections can be constructed on the construction side, then brought around to the well center using carousels (capable of holding 252 drill pipes of 135ft each and 70 casings of 135ft—about 34,000ft and 9500ft in total respectively) on either side of the tower, with automated handling of both stands and risers.

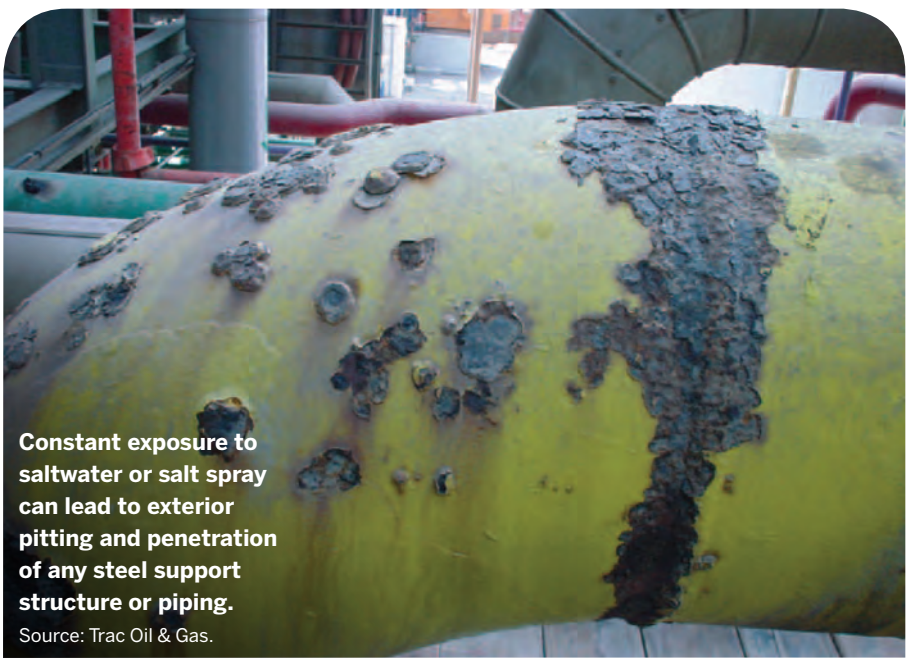
The tower also enables equipment to be stored away from the elements. The top drive garage means that top drive maintenance can be carried out inside and with room inside the MPT for proper access. Maintenance can be carried out safely and effectively. When the topdrive is stored for maintenance; tripping, casing running can be continued. The riser tensioner system is underneath the drill floor inside the hull. ■

# Corrosion problems solved with composite materials

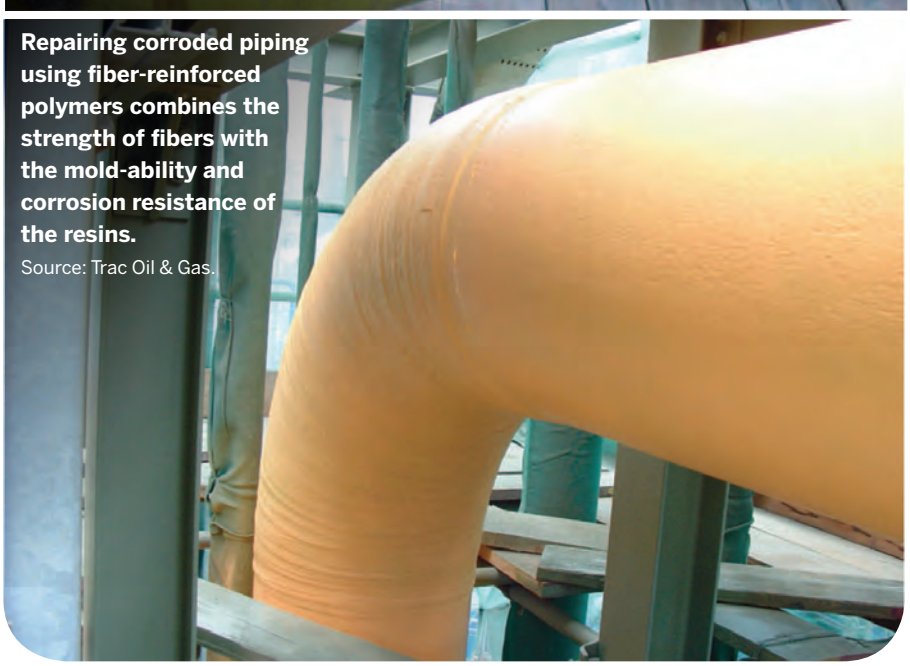
**Repairs of corroded supports are quick and effective when composite materials are used; Victor Schmidt explains.**

Corrosion in the marine environment is a process constantly acting on offshore structures, due to immersion in salt water and constant exposure to oxygen through wind and waves. Corrosion weakens structures and can lead to buckling or complete failure of supporting members and attached cross-bracing.

Routine maintenance will help preserve steel structures, but over years, the constant exposure can lead to exterior pitting and penetration. In addition, caissons for fire support, which are open internally to move seawater, and drainage pipes are subject to hidden damage. If corrosion weakens pipes carrying crude or natural gas in the processing system, there is the potential for burst pipe and fire.



**Constant exposure to saltwater or salt spray can lead to exterior pitting and penetration of any steel support structure or piping.**
Source: Trac Oil & Gas.



**Repairing corroded piping using fiber-reinforced polymers combines the strength of fibers with the mold-ability and corrosion resistance of the resins.**
Source: Trac Oil & Gas.

Replacing the weakened components is one option, albeit an expensive one. Another option is to clean and reinforce the affected supports with exterior protection: welding additional metal to cover and seal the corroded area, or applying a reinforcing clamp for added structural strength. Both increase dead weight on the structure and can change load dynamics. Clamps often must be custom built, have limited length, and may not be strong enough to hold wave loads.

Replacement or clamping strategies work well on simple cylindrical members, but become problematic where complex joins bring two or more support members together. They can also be problematic for process piping with complex bends, and clamps are not adaptable for flanges or other protrusions.

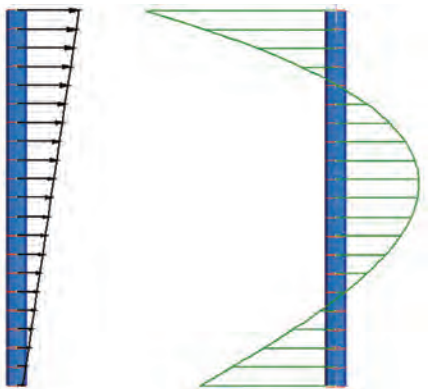
Another option is to use an easily applied composite material that can be shaped to the compromised complex structure. Composites combine two or more materials to form a new material with the strengths of both. Fiber-reinforced polymers combine the strength of fibers (glass, carbon etc.) with the mold-ability and corrosion resistance of polymer resins. It is best to use glass fiber where internal pressure retention is important and carbon fiber where structural loads are critical.

Composite materials can be used in a wide variety of environments due to their service range. Workers can apply them in temperatures from

+10°C to +50°C. Composites are stable at temperatures from –50°C to +150°C and can be built to contain pressures up to 120 bar. They do not require heavy lifting equipment to install, are applied wet, and cure in place. They are also ease to use for splash zone repairs.

Composite material can restore the structural integrity of caissons and other large diameter pipes affected by mechanical damage or wall thinning due to external and internal corrosion. Using finite element design to identify high stress areas, a composite-based repair can be created to resist bending, shear, and axial stresses from static loads (i.e. jackets and process equipment), internal pressures, and bending loads generated by wind and wave.

A repair using composite materials can be designed to meet all international engineering standards for static and induced loads, can be used on all geometries, can be worked cold (no hot-work permits needed) on surfaces prepared to ST2 standard, can be applied by individuals working from ropes or from scaffolding, and is both durable and cost effective.



**A typical caisson receives bending loads from wind and wave as in this computer force model.** Source: Trac Oil & Gas.

## Case study

A major offshore platform in the southern North Sea had severe problems on the fire pump return caisson with multiple, corrosion-related penetrations. The operator attempted to repair the problem with multiple clamps, but was not able to completely restore integrity. Leakage was still evident and new leaks were appearing.

The operator decided to use a composite repair. After removing the clamps, over 400 holes were found in the caisson, ranging from 2-100mm, over a 15m section of pipe. The affected area was cleaned to ST2 standard and the caisson holes were plugged. Kevlar-reinforced epoxy putty was spread over the 15m section, which was then sealed by wrapping with fiber sheeting. The epoxy permeated the fiber sheath and was allowed to cure. Next, an additional 3mm layer of epoxy putty was applied, and then ten layers of a colored composite laminate were applied and compressed around the pipe to form a lasting seal.

The repair was designed for a service life of 20 years and took six days to complete. A test of the repair flowed 8500 gal/min through the caisson without a leak, proving the effectiveness of the operator's choice.

Maintaining integrity of offshore structures is a challenge for operators. Fiber-reinforced composites are a durable way to address the problem and extend the working life of load-bearing structures and essential piping. OE

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# Draugen: Exceeding expectations

**Draugen was the first field developed in the Norwegian Sea 20 years ago—Shell now expects it to produce for a further 20 years, doubling its expected life span. Asset manager Odin Estensen explains how.**

The story of Draugen is more than just the story of a field. It is a also story about courage, learning, understanding, and implementation.

Draugen was the first field to be developed in the Norwegian Sea, pioneering production from an area which later became one of the important petroleum provinces in Norway. In 2013, Draugen marks 20 years since the start of production. Draugen was expected to reach end of field life in 2013, according to the initial plans, but we are currently in the process of extending Draugen's lifetime till 2036.

### The reservoir history:

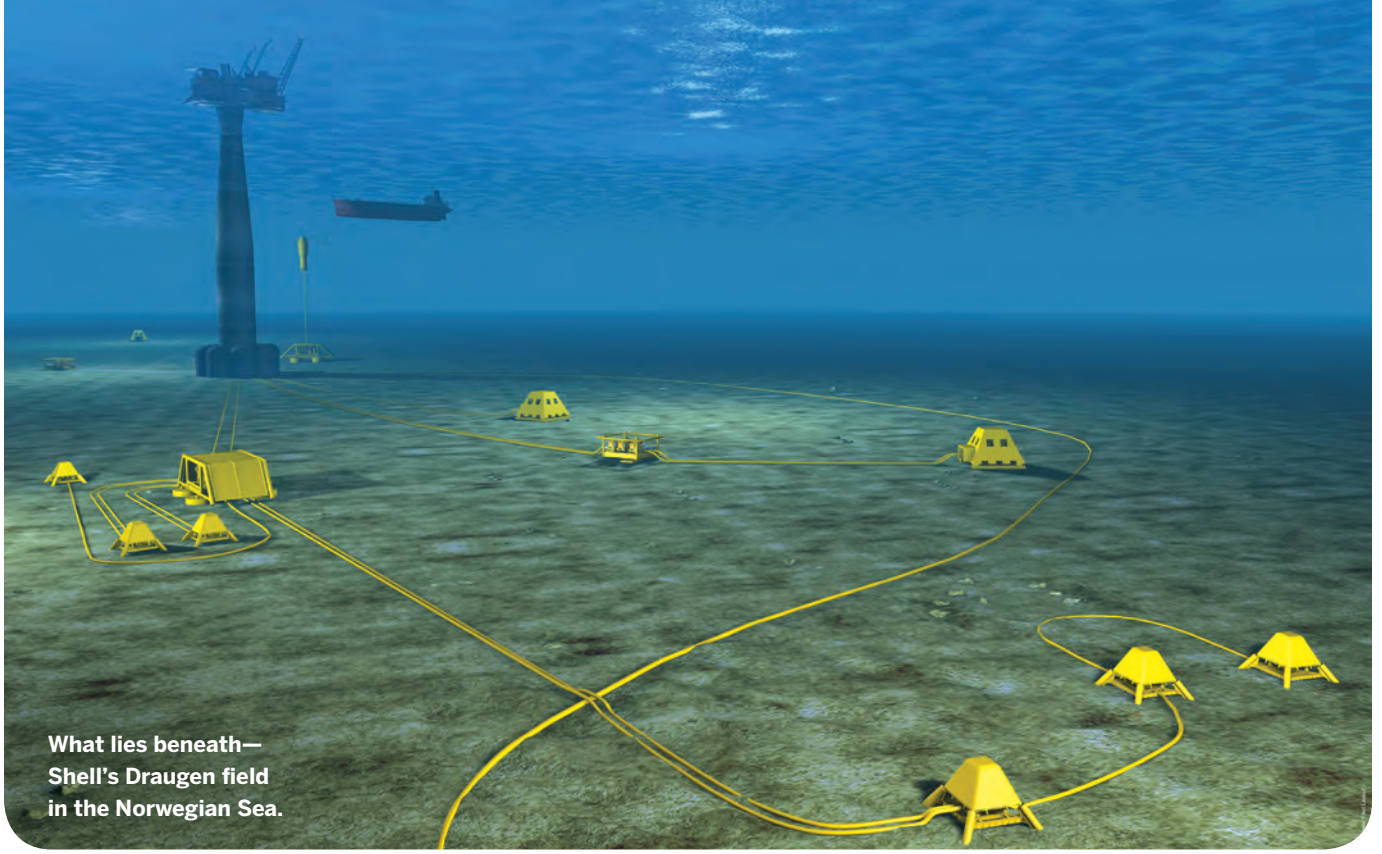
Draugen was discovered in 1984, in an area where most geologists did not bother looking for hydrocarbon-bearing reservoirs. Oil from Haltenbanken had migrated eastwards and up, and Draugen was discovered at a shallower level than the other reservoirs in the area. The producing formation had excellent characteristics. We assumed a recovery factor which seemed realistic at the time, in the late 1980s: about 17% of the oil would be produced. Today the recovery is multiplied by four, now getting close to 70%. The average recovery factor in Norway is 46%. We are in the lead in Norway when it comes to extracting the maximum amount of oil out of a reservoir.

However, the good reservoir quality is not the only reason why Draugen has achieved such a high recovery rate. By natural underground pressure, the statistical recovery rate is expected to be only 5-15%. We therefore implemented an active reservoir management strategy.

**Shell's Draugen platform in the Norwegian Sea.**

Our first step was to add pressure support. This key decision was already in Draugen's Plan for Development and Operation (PDO), submitted in 1988. We installed water injectors at each end of a long and fairly narrow field. By doing this, the reservoir pressure was maintained while also pushing the oil towards the middle of the field, where the platform is located. This approach raises the statistical recovery factor to 35-45%.

We have continuously monitored the fluid movements in the Draugen reservoir by extensive use of seismic surveys. The first seismic acquisition was made before production start-up and has since been repeated four times at regular intervals. With the exception of one high resolution seismic acquisition in 2004,



What lies beneath—Shell's Draugen field in the Norwegian Sea.

these have been conventional seismic acquisitions. The next seismic will be broadband seismic, but still compatible with the previous seismic, such that 4D data still will be achieved.

The sixth seismic survey will be conducted in the summer of 2013, using PGS' *Atlantic Explorer*. Seismic surveys enable us to understand the reservoir dynamics and make even better decisions.

To give an example: based on the seismic information acquired in 1998, we changed the location of a planned production well from west of the platform to more than 1km away to the north of the original target. The outcome was a well that was tested at 78,000 b/d. That is one single well performing close to an entire oilfield. If the location had not been changed, we would have ended up with a poorer well, with significantly higher water cut.

There are relatively few wells on Draugen, only 11 production wells. Several of them have produced over 150 million bbl, which is more than many fields produce from all their wells throughout their entire field lifetime.

Seismic surveys have thus given us a good understanding of the reservoir dynamics, to see where the oil flows, and where it is trapped. Drilling additional subsea wells was part of the initial Draugen development concept. This, too, would be done based on the "less is more" philosophy – not many, but efficient wells. Future subsea wells were included in the platform design phase and a significant subsea development was foreseen in the PDO (Plan for Development and Operation) document. Six of the 11 wells on Draugen today are subsea wells, while five are platform wells. Four of the subsea wells were drilled and commissioned west and south of the platform in 2001 and 2002. The two last subsea wells were installed in 2007 and 2008.

We have planned four strategically placed subsea production wells for the upcoming drilling campaign, which will start shortly using the *West Navigator* drillship. This summer's new seismic can hopefully tell us where we might locate additional future wells.

Subsea wells usually give a lower recovery than platform wells. In response, Shell will rely on technology similar to that first pioneered in 1993: mudline pumps. Through partnership with Framo Engineering, Shell plans to install a subsea, multiphase booster pump downstream of the Garn West manifold, about 4 km from the platform in 280m water depth. This is predicted to help boost the recovery factor to over 70%, which is probably one of the highest recovery factors achieved from an oil reservoir.

We have assessed $CO_2$ injection for pushing yet more oil out of the reservoir, but found it uneconomic for Draugen. The next step is to assess injection of other types of chemicals, which will make the oil smoother and hence easier to move towards the production wells.

So far, the reservoir-technical recipe for a high recovery on Draugen is water injection, our production philosophy and planning with seismic, and subsea tiebacks. But there is one more key factor:

## Maintenance

The older the installation, the more maintenance is needed. Technical integrity is one of the major factors for increased oil production from existing platforms. We made a calculated risk in designing Draugen with a just a few wells and only one processing train. It required lower investment and less need for maintenance and monitoring. However, it also led to greater risk and greater consequences if something went wrong. It presumed that all wells and processing equipment would function optimally – all the time. This scheme requires solid integrity management. Draugen delivers production

reliability normally above 90%, which is very high compared to most offshore installations of similar age.

Draugen was supposed to produce until 2010, and the authorities approved a lifetime until 2013. Even so, our maintenance and operations philosophy has always been that Draugen will live forever. A pledge that is now paying off.

Our commitment to meticulous maintenance and ensuring well-run machinery that is carefully looked after has been an important factor in safely maximizing the extraction of resources from the Draugen reservoir. The stable and dedicated workforce running the platform has been of paramount importance.

Our maintenance philosophy has been based on 'doing it right the first time.' It requires good planning and well-prepared job packages from the onshore support organisation in Kristiansund, allowing the offshore workforce to focus on the physical execution. Proactive maintenance has not only been narrowed to technicalities, but also involves tailor-made "on the job training" for continuous development of people skills and competencies.

Draugen has an impressive history and we think there is more to come. This is the reason for purchasing BP's interest in the partnership last year. Shell's ownership interest is currently 44%. We have just submitted an application to extend Draugen's lifetime from 2013 to 2036. The application defines what measures will be necessary to upgrade Draugen for the future. Project examples involve upgrade and expansion of the platform living quarters, upgrade of the control room systems, installing new lifeboats, installing reinjection of produced water, removing the old loading buoy, and installing a new crude oil loading system. From Jan. 1, 2012, Aibel AS has been the main contractor on Draugen. There is often a strong focus on new discoveries, new developments, and new installations. The activity level on Draugen shows that maintenance and long-term strategies pay off with high reliability and stable production. Our actions show that we see opportunities for profitable operations on Draugen for many years to come.

Draugen is a field that has delivered more than what we dared to hope for. OE

**Odin Estensen** *is asset manager for Shell operated production in Norway. He has held various Shell positions in Norway, the Netherlands and UK since 1990, as drilling supervisor, project engineer, and contract engineer in well engineering. He has been offshore installation manager on Draugen, non-operated venture asset manager, HSE manager Shell Europe, and safety and environmental delivery manager for Shell Upstream International. He earned an MS in Petroleum Technology at NTH-Trondheim and an Executive MBA in Strategic Management at NHH-Bergen.*

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# Umbilicals bring new production to China's Liuhua field

**After a major storm crippled production from Liuhua field, a major life extension project and new umbilicals from JDR Cable systems renewed an aging property; Victor Schmidt explains.**

Recently, JDR Cable Systems deployed several subsea production umbilicals and power cables for electrical submersible pumps (ESP) in a South China Sea, subsea-tieback project for China National Offshore Oil Corporation (CNOOC). The project was part of a much larger field-life extension effort by CNOOC for the Liuhua 11-1 development (LH 11-1), which included the tieback and start-up of the Liuhua 4-1 oil field (LH 4-1).

**Umbilicals were loaded onto a single carousel, similar to this operation on a different project.** Source: JDR Cable Systems.

The larger project extended LH 11-1's working life by 15 years and expanded the capacity of the FPS Nanhai Tiaozhan and FPSO Nanhi Shengli to handle new production from development of the LH 4-1 field. LH 4-1 produces to the LH 11-1 FPS through an 11km, 18in.-diameter pipeline.

## Background

The LH 11-1 development is in the South China Sea is 200km southeast of Hong Kong and produces heavy crude from 25 wells in 310m water depth. The main reservoir is 914m below mudline. The field began producing in 1996 and was initially designed for a field life of 10 years.

The FPS Nanhai Tiaozhan semisubmersible provides power to downhole ESPs and engineers onboard control the subsea equipment and production rate of the field. The heavy API-gravity crude is moved by the ESPs to the FPSO Nanhi Shengli through two 13.5in.-diameter production pipelines.

Liuhua11-1 field was developed and produced until 2006, when a major tropical cyclone, Chanchu, broke three flexible risers and six of the ten mooring lines. After a riser repair and recovery project, and drydock for life extension, the FPSO Nanhi Shengli was put back into service and reconnected. It was then that Liuhua 4-1 field could be brought into production through a tieback to the Liuhua 11-1 FPS.

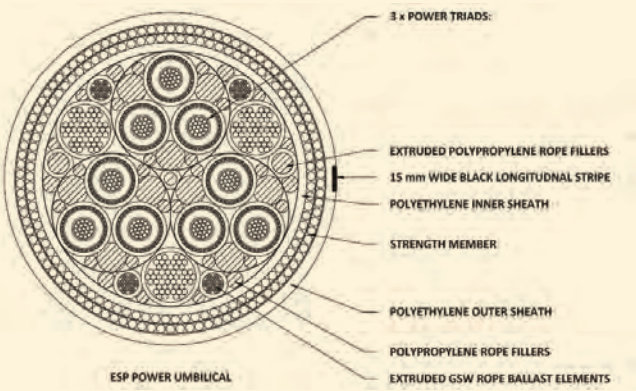
LH 4-1 field is about 11km northwest of LH 11-1 in 260-300m water depth and about 215km from Hong Kong. The field was discovered in 1987, but could not be developed due to technical limitations at the time. The field is an eight-well development; seven horizontal wells produce from a reservoir at 1622m below mudline, and one well produces from two zones at 900m and 1465m. Future expansion can accommodate four additional wells, which, when drilled and completed, will produce through a separate manifold.

The field is controlled by a composite electro-hydraulic system tied-back to the FPS, from which control signals regulate hydraulic power and chemical injections. Each well has dual ESPs for redundancy; production can continue if an ESP fails. This capability delays the expense of a semisubmersible intervention to replace failed equipment. Production is pumped 11km through an 18in.-diameter pipeline to the main LH 11-1 manifold, where the crudes are comingled and sent to the FPSO through the two existing pipelines.

This arrangement requires variable frequency power to individually control each ESP and balance output among the wells. The FPS was also upgraded as part of the life extension project to pro-

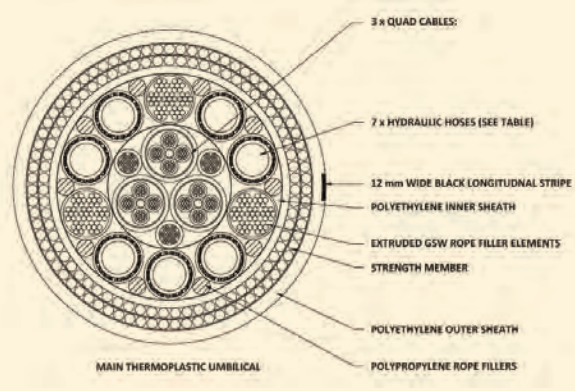
**JDR's Hartlepool, UK facility was chosen for the LH 4-1 umbilicals, so that all could be manufactured concurrently.** Source: JDR Cable Systems.

**ESP power umbilical**




**Each power umbilical has three, 3-phase power circuits to drive ESPs and provides a spare circuit.** Source: JDR Cable Systems.

**Main umbilical**




**The main umbilical was optimized for hydraulic control system response and chemical injection.** Source: JDR Cable Systems.

vide the necessary power and controls for the new wells. The LH 4-1 field uses a high-power changeover switch to control the ESPs, so that manual switching via ROV is unnecessary. This field is the first subsea development to use this technology, according to CNOOC.

### Umbilicals

JDR was contracted by CNOOC to develop and manufacture more than 42km of subsea production umbilicals and ESP power umbilicals for LH 4-1. The oil field includes one manifold for the eight production wells, jumpers, and an 18in.-diameter subsea pipeline. JDR supplied three, 14km ESP power umbilicals, one 14km main production control umbilical, and a bridging manifold control umbilical.

Each ESP power umbilical included three, 3-phase power circuits to electrify the eight wells and provide a redundant spare circuit. This nine-core-style power umbilical reduces the number of risers needed, lowers complexity, and minimizes project cost. The umbilical bundles were built on JDR's vertical lay-up machine; thee 60 tonne/bobbin capacity reduced the number of core splices required.

The main thermoplastic umbilical was selected to maximize system reliability and minimize project cost. It was optimized for hydraulic control system response and for delivery of injection chemicals. The cross-section was designed with the drag diameter-to-weight ratio necessary to meet dynamic mode requirements.

The contract included dynamic riser design; modeling FPS movements during workovers of the existing LH 11-1 wells directly below the semisubmersible. The main and power umbilical risers were optimized to provide fatigue resistance for the system's design life.Riser engineering had several components requiring tension/angle plots for bend stiffener design, FPS hang-off loads, touch-down point location and arc-length, buoyancy module distribution, riser tension across the umbilical length, and minimum-maximum, sag/bend clearance.

Hardware delivered included flexible pull-in heads, hang-off bodies and split clamps, dynamic bend stiffeners, buoyancy modules, riser base clamps, and subsea termination units.

The Hartlepool, UK facility was chosen for the LH 4-1 project so that all the umbilicals could be manufactured concurrently. To ship the umbilicals to China, JDR had a heavy-lift vessel fitted with a temporary, 2,000-tonne carousel to carry the load. The single carousel held all four umbilicals along with topside hardware, dynamic bend stiffeners, and subsea terminations. Upon arrival, the umbilicals were transferred to another vessel for installation. LH 4-1 field produced first oil in July 2012. OE

### Updated umbilical glossary available

With umbilical system complexity constantly increasing, the Umbilical Manufacturers' Federation (UMF) has acted to standardize terminology by publishing a "Glossary of Terms and Abbreviated Terms for use with Umbilical Systems" in a guidance note, UMF – GN02.

UMF's goal for the reference is to remove ambiguity. The glossary will aid communication at all stages of the manufacturing process: design, procurement, and supply, so that design requirements are clear. The text will be updated periodically and the current version (issue 3) can be accessed and downloaded from the UMF website, *www.umf.as.*

The organization provides additional guidance notes on umbilical interfaces, free span analysis, comparisons of steel tubes and thermoplastic hoses, and data sheets for super duplex tubing. UMF was established in 2001 and includes manufacturer's: Aker Solutions, Duco, JDR Umbilical Systems, Nexens, Oceaneering , and Parker Scanrope.

## FURTHER READING

**Energy's new era**
OE March 2013 - OE exclusive

**Beibu in production**
OTC January 2013 - online only

**Chevron scores Chinese PSCs**
OE January 2013 - online only

**China deepens its resolve on energy security**
OE July 2010

**Rolling in the deep**
Annual survey of key deep water developments worldwide, OE April 2012, pp. 42-70.

**UMF Member delivered Control Umbilicals: 2001 – 2011**

| | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. Control umbilical with fluid conduits (km) | 772 | 1081 | 848 | 470 | 688 | 1409 | 1754 | 973 | 825 | 875 | 1525 |
| 2. Number of control umbilical with fluid conduits | 156 | 189 | 138 | 63 | 72 | 222 | 249 | 160 | 159 | 245 | 275 |
| 3. Categories of control umbilical | | | | | | | | | | | |
| 3.1 Hydraulic umbilical (km) | 53 | 138 | 16 | 6 | 11 | 5 | 17 | 12 | 21 | 6 | 35 |
| 3.2 Electro-Hydraulic Umbilical (km) | 561 | 929 | 798 | 452 | 657 | 1073 | 1224 | 811 | 481 | 756 | 1318 |
| 3.3 Electro-Fibre Optical-Hydraulic Umbilical (km) | 158 | 15 | 35 | 12 | 20 | 331 | 513 | 150 | 324 | 105 | 161 |
| 3.4 Medium voltage umbilicals (3.2 & 3.3 above) | | | | | | | | | | 48 | 58 |
| 4. Fluid conduits (km) | | | | | | | | | | | |
| Super duplex tubes | 3112 | 3808 | 2699 | 2216 | 4541 | 10605 | 10047 | 5672 | 7109 | 5565 | 7865 |
| Thermoplastic hoses | 3798 | 4210 | 3721 | 3206 | 3276 | 5232 | 5519 | 3034 | 1434 | 3042 | 3771 |
| Medium voltage cores | | | | | | | | | | 598 | 572 |
| Other metallic tubes (previously Carbon steel tubes) | 511 | 336 | 2488 | 90 | 70 | 397 | 132 | 15 | 372 | 46 | 331 |
| 5. Total length (km) | 7421 | 8354 | 8908 | 5512 | 7887 | 16234 | 15698 | 8720 | 8915 | 9251 | 12539 |

Note: This data provides information on control umbilical volume supplied to the offshore oil and gas industry by UMF members and does not reflect the total world market. Source: Umbilical Manufacturer's Federation

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9th Annual

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>
> **Mike Bednarz, BP**

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# 2013 Deepwater Preliminary Agenda

9th Annual
DEEPWATER INTERVENTION FORUM

## Tuesday, August 13TH

| | |
|---|---|
| **Golf Tournament at Moody Gardens** | Sponsored by OCEANEERING |
| **"Plan and Prepare for Subsea Well Intervention Workshop"** | Chairs:<br>Barney Paternostro, LLOG<br>David Brown, Tetra<br>David Wright, Wright's Well Control Services<br>Lynard Carter, BSEE |
| **Opening Night Reception** | Sponsored by HALLIBURTON |
| **Hospitality Lounge @ San Luis Hotel** | Sponsored by WELL OPS |

## Wednesday, August 14TH

| | |
|---|---|
| **Introduction and Opening Remarks** | Mike Bednarz, DIF Co-Chairman bp |
| Keynote **"Designing to Reduce Training Time"** | Tyler Schilling, President/ General Manager FMC Schilling Robotics |
| Keynote **"Developing Competency in Well Control"** | Kevin Cary, General Manager, Chevron |

## Thursday, August 15TH

| | |
|---|---|
| **Introduction and Opening Remarks** | John Bousa, DIF Co-Chairman subsea 7 |
| Keynote **"Jones Act"** | Robert Alario, Alario & Associates |

Sessions Include: New Technologies, Case Histories, Operators Panel, Standards & Regulatory Updates

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# 2013 Deepwater Intervention Forum

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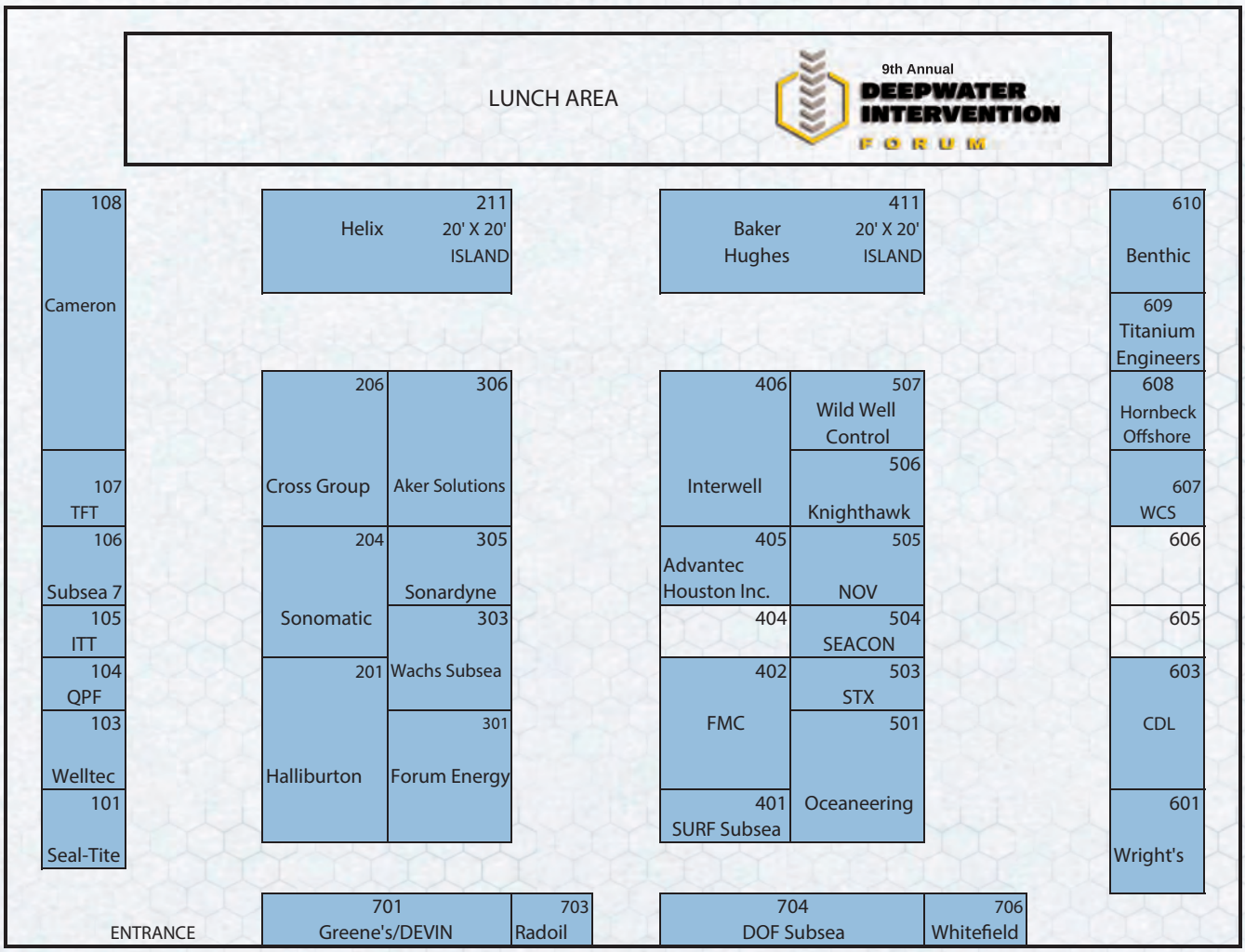


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| CDL Inc. | 603 |
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| FORUM ENERGY TECHNOLOGIES | 301 |
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# Real time micelle detection in development

**An additional tool for corrosion management: the power of corrosion inhibitor micelle detection.**

Management of internal corrosion typically involves monitoring a number of properties of a system with, for example, coupon testing, residual inhibitor monitoring, corrosion rate probes, and intelligent pigs.

One important component of corrosion management is the use of corrosion inhibitors, which help protect infrastructure.

Organic film-forming corrosion inhibitors, the type of inhibitor commonly used in the upstream oil and gas industry, are unlikely to maintain their association with the metal surface for a very long time as they suffer physical forces from fluid flow.

Rather, the film is constantly being broken and must therefore be replenished by inhibitor from the bulk solution. It is important that an adequate bulk concentration is present to ensure that the film integrity is maintained.

However, what represents an adequate bulk concentration and how can this be monitored? Often the chemical dosage is determined from laboratory testing. Such testing can help in the identification of suitable chemicals and provide data on dosage.

In the field, this dosage may then be checked with residual monitoring, which determines the amount of a formulation component in a sample of fluid. Yet conditions in the field may differ significantly from those that can be set up in the laboratory, for example with regard to pressure, temperature, and the complex mix of treatment chemicals, solids, oil, and water.

Furthermore, when systems change (for example with changing water cut, or wells being brought on or taken off line) dosage may need to be modified to remain optimal.


A tool, which determines optimum dose onsite, would be advantageous. The result would be improved integrity management, potential chemical savings, and potential benefits for oil—in-water separation, given the surfactant nature of the inhibitors.

## The science

Reports have demonstrated a link between the critical micelle concentration (CMC) of surfactant-type corrosion inhibitors and the inhibitory effect. Below the CMC, the film consists of a non-continuous surface, which can be penetrated and allow corrosion to occur.

Above the CMC, the film is denser and multi-layers can form. There is a significant drop in increasing inhibitor performance at concentrations above the CMC, and so in most circumstances it can be thought of as the optimal dose of corrosion inhibitor.

## Research Program

LUX Assure has worked with a major North Sea operator since 2009 to develop a corrosion inhibitor micelle detector that could be used in the field to generate near real-time data. The result of this project, CoMic, is a novel tool to improve corrosion management, which has been deployed at UK assets and further afield to improve corrosion management.

## Case Study:

Production fluids may be transported between different platforms to most efficiently process them. These flow lines can be susceptible to corrosion and must be managed accordingly. In this example, the operator of a field in the North Sea had received conflicting information from traditional methods about the efficacy of the corrosion inhibitor dose.

Two corrosion detection methods were being used one of which suggested adequate protection at the pipeline exit and one which did not. The corrosion inhibitor micelle detection

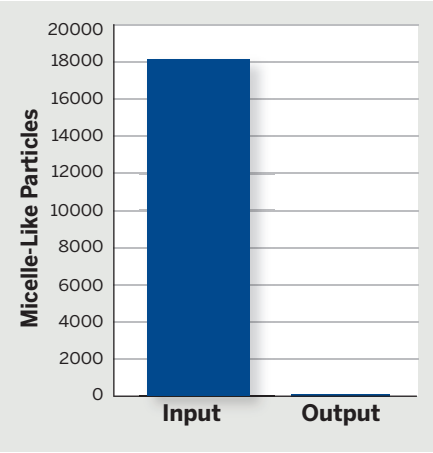



Figure 3. Corrosion inhibitor micelles dropped during fluid transfer.

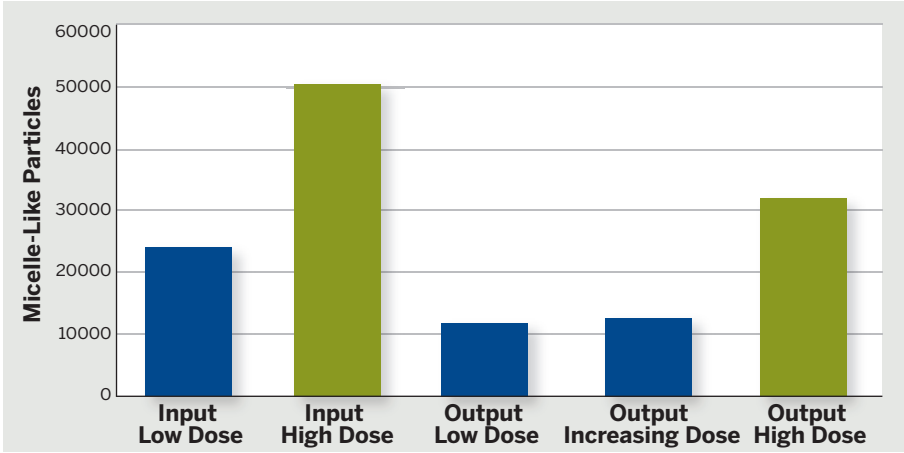



Figure 4. A later visit with a different chemical and dose rates increased the micelles detected.

method was used to verify whether there was an optimum dose at entry and exit points.

Samples were taken from the sampling points at the pipeline's entry and exit, and then transferred to the offshore laboratory. They were quickly analysed, using the CoMic instrument and LUX Assure personnel, for the presence of corrosion inhibitor micelles.

Timing is important as corrosion inhibitor micelles are known to change when left in a static oxygenated environment for the long periods associated with shipping samples, so onsite analysis is considered important to ensure accurate results.

During a first test, samples entering and exiting the pipeline were assessed. Corrosion inhibitor micelles were apparent in the brine phase of the fluids entering the pipeline, but the micelles had been consumed by the time they had arrived on the destination platform.

This analysis provided new information for the facility manager to understand the corrosion risks that existed in the pipeline.

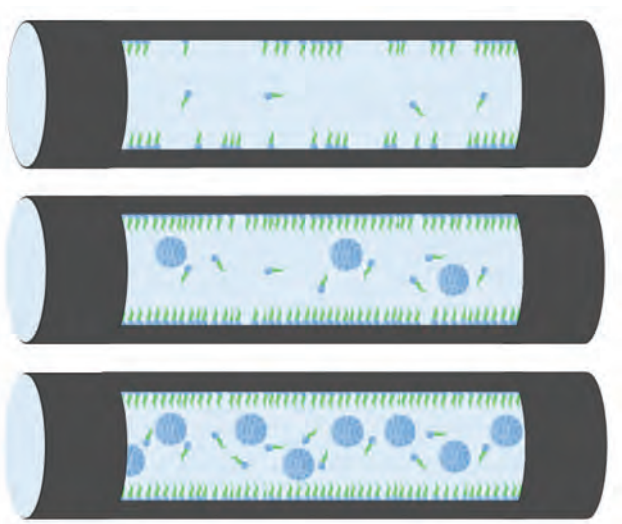
On a follow-up visit, samples were measured from the same system again, but on this occasion a different chemical was being used to improve corrosion inhibition, and two different inhibitor dose rates were analysed (low and high).

Results suggested the presence of micelles both at the pipeline's entry and the exit (adjustments to the instrument between analyses means that the scales on ordinate axes of figures cannot be directly compared).

The move to a higher dose resulted in an increase in micelles detected. Results of the other analyses (e.g. corrosion rate) were not available to LUX Assure, although they would have provided additional, complementary information to the operator and showed the difference in corrosion rates that can be brought about by an increase in micelle content.

Accurate results from corrosion probes are dependent on access to appropriate measurement locations and can be subject to inaccuracies due to scale formation and changing flow-regimes, for example. When combined with the effective chemical dose, knowledge provided by micelle detection, the limitations of such data can be strengthened and more informed decisions can be made.

LUX Assure applies life science concepts to monitor difficult to detect chemicals used in the oil industry. Having recently raised significant investment in 2013, LUX plans a period of growth and transformation into a service provider. OE



**Below the CMC**
Potential for higher corrosion rates than if the chemical were dosed at the CMC

**At the CMC**

**Above the CMC**
Potential for unwanted side effects (cost, separation issues, environmental discharge)

***Emma Perfect*** *is LUX Assure's chief scientific officer and managing director. She manages a team of highly skilled scientists and heads research programmes within the company. With extensive experience in assessing new technology opportunities, she is instrumental in bringing new technology into LUX Assure to build up the company's core skills. She has a first class honours degree in Biological Sciences from University of Oxford and a PhD in plant disease.*

# Organizing the weather off Sakhalin

By Nina Rach

Other than economics, logistical planning is the heart of any major project. Weather can have a significant impact on project success or failure, and while it can't be controlled, it can be managed, even in a relatively remote location.

The operating conditions off 950-km long Sakhalin Island include severe wave, wind, and earthquake activity year-round and pack ice 1-1.5m (3-5ft) thick for half the year.

To overcome these "daunting weather-related barriers," Exxon Neftegas Limited (ENL), a subsidiary of Exxon Mobil Corp. and operator of the Sakhalin-1 project, used on-site meteorologists for the 2012 offshore (ice-free) season.

## Setting

Sakhalin Island, off the east coast of Russia, is situated between 54° 42'N latitude at its northernmost point, Cape Elizabeth, and 45° 54'N latitude at its southernmost point, Cape Crillon. Hokkaido, Japan's northernmost island, is separated from Sakhalin Island by only 40km across the La Pérouse Strait. Also known as the Soya Strait, this international waterway connects the Sea of Okhotsk with the Sea of Japan.

The Sea of Okhotsk borders the east coast of Sakhalin Island, but it is separated from the Pacific Ocean by the Kuril Islands, which stretch northeast from the east coast of Hokkaido to the southern tip of the Kamchatka Peninsula.

The west coast of Sakhalin Island is separated from mainland Russia by the Tartar Strait, which narrows to only 7.3km across the Nevelskoy Strait.

Yuzhno-Sakhalinsk, which means "South Sakhalin City," is the capital of Sakhalin Island. It is also the administrative center of the Sakhalin Oblast (one of 46 oblasts in Russia), and runs the Kuril Islands. The city was founded in 1882, but the modern infrastructure is from oil and gas development on the Sakhalin shelf.

## Sakhalin-1 background

Sakhalin-1 is a consortium that produces oil and gas from three sub-Arctic fields off the northeast coast of Sakhalin: Chayvo, Odoptu, and Arkutun-Dagi. The consortium is managed and operated by Exxon Neftegas Ltd. (ENL), a subsidiary of Exxon Mobil Corp. Partners in Sakhalin-1 include Exxon Mobil (30%); Japan's Sakhalin Oil and Gas Development Co. Ltd. (Sodeco; 30%); Indian state-owned ONGC Videsh Ltd. (20%); and Russian state-owned Rosneft subsidiaries Sakhalinmorneftegas-Shelf (11.5%); and RN-Astra (8.5%).

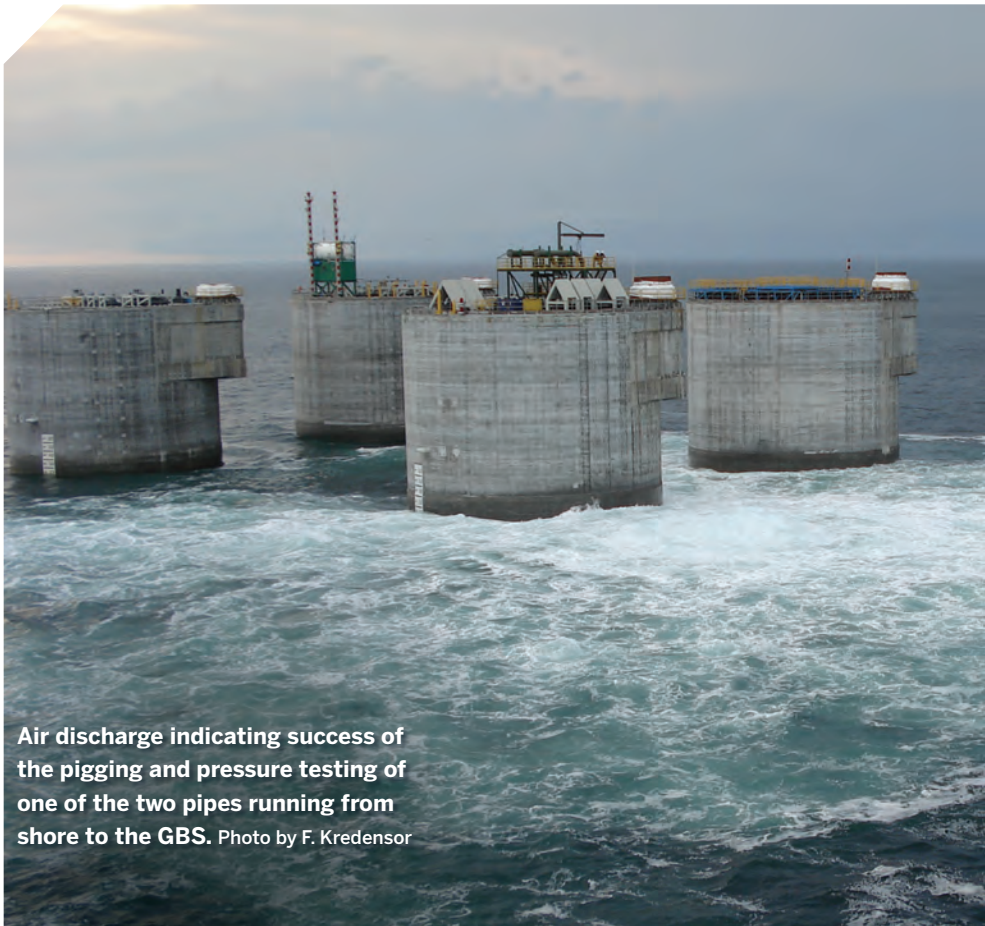
The first phase of Sakhalin-1 development started in 2002 and included extended-reach wells drilled from the land-based, 70m-tall drilling rig, Yastreb, meaning "hawk." The rig was designed to withstand earthquakes and arctic conditions. The Chayvo field was developed first, using the Yastreb rig and the Orlan rig on the Orlan platform, a concrete island drilling structure just of the coast from the Chayvo wellsite. Production from Chayvo began in October 2005, with 50Mbo/d.

Following the Chayvo drilling, ENL moved the Yastreb rig north to drill the Odoptu field in 2008, and drilling there began in 2009, followed by first production in 2010.

## Weather, seismicity

Perhaps unfairly known for hostile conditions, the weather in Sakhalin is cold and humid, with average rainfall between 600-1200mm (23-47 in.), winter temperatures between -24°C (-11°F) and 10°C (50°F), and summer temperatures usually below 13-15°C (55-59°F).

Temperatures fluctuate with monsoonal circulation and the Sea of



**Air discharge indicating success of the pigging and pressure testing of one of the two pipes running from shore to the GBS.** Photo by F. Kredensor

Okhotsk, the coldest in East Asia, can carry floating ice even in summer.

Earthquakes are now most prevalent at the north end of Sakhalin Island and in the Sea of Okhotsk, although 8-10 years ago, epicenters were located in the south and central parts of the island (www.earthquaketrack.com).

Some of the seismic activity can cause considerable damage, even in this sparsely populated area. In August 2007, an earthquake nearly destroyed Nevelsk and nearby villages on the southwest coast. The offshore epicenters of the two tremors, registering 6.2 and 5.9 on the Richter scale, were 10km and 20km deep in the Tatar Strait.

## Forecasting

Wilkens Weather Technologies LP, a Rockwell Collins Company (WWT) has provided offshore and onshore weather forecast services to ENL in the Sakhalin Island area since 1999. The forecast services encompass daily wind, wave, temperature, visibility, and weather condition forecasts for multiple locations, but the primary operating areas are the Orlan platform and Chayvo area. In 2003, WWT also began working with a third party, Calgary-based Canatec Associates International Ltd., to include ice forecasting services. Weather forecasting services are fully integrated into daily operations for Sakhalin-1.

Extensive activity during the short summer work season brought many different contractors to the Sea of Okhotsk in 2011, for initial development work on the Arkutun-Dagi project, which included laying pipe from the shore base to the platforms. Vessels came from all over the world, with company policies extending from Europe, USA, and Asia. Each company and vessel captain had their own preferred weather forecast provider. At least half of the ten major weather forecasting companies were providing reports to the various contracted parties, causing a massive conflict of information and opinion. Major contractor Heerema, for example, relies on the UK's Met Office. Some ship captains would refuse to work based on private weather reports. There was a great deal of lost work time due to poor weather decisions. Some operations were delayed and not completed until the beginning of ice season (December).

In February 2012, ENL asked WWT to send personnel on site to work onboard the lead project vessels. The ENL-designated forecaster would act as the project weather expert and all decisions would be based on the forecasts produced on site. External (remote) forecasts could not be used for operational decisions. Captains could choose to keep their other forecasts, but in the field, installation go/no-go decisions would be based on the project forecaster's input. The idea was to centralize decision-making, streamline operations, and keep conflict to a minimum.

This involved a lot of trust among the contractors, especially those operating on lump-sum contracts. However, the cost of keeping forecasters on site was apparently worth the investment, to complete the project on time, rather than running over schedule and over budget.

### THE NUMBERS

**Arkutun-Dagi GBS**

| | |
|---|---|
| Weight | About 160,000 tons |
| Concrete | 52,000 cu m |
| Steel rebar, cables | 27,000 tons |

**GBS tow** (two weeks)

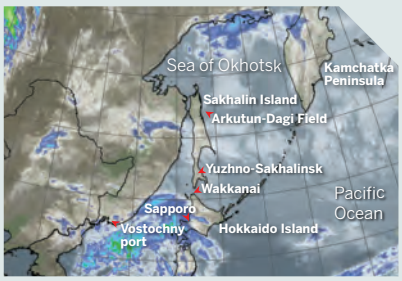
| | |
|---|---|
| Distance | 1024nm (1870km) |
| Speed | 3.5 knots (5.5km/hr) |

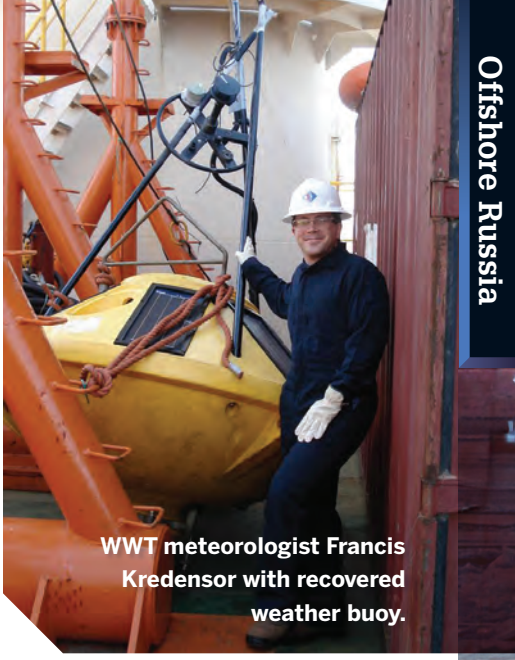
**Vessels**

| | |
|---|---|
| Command vessel | *Lewek Crusader*, EMAS AMC |
| Operation support | *Nordnes*, Van Oord (rock-laying, flexible fall-pipe) |
| Three Tugs: | *Salveritas* from Posh<br>*Shin Chou Maru* from Alp Maritime<br>SOV *Carlisle* from Hallin Marine |

**Location**

| | |
|---|---|
| Sea of Okhotsk | 25km off Sakhalin Island<br>35m water depth |



WWT meteorologist Francis Kredensor with recovered weather buoy.

## 2012 project scope

The first phase of the work was to tow the Berkut platform base to Sakhalin from Vostochny, Russia, and install it at the Arkutun-Dagi field. Then, the platform was connected to the pre-laid pipeline system, additional pipeline installed, and the pipeline route and the margin of the GBS protected from scour.

Three meteorologists from the Houston WWT office worked off Sakhalin through the summer, May-August 2012. The first onsite meteorologist was Jennifer Hibbert, who was mobilized to Vostochny to assist with the initial float-out of the GBS all the way through the end of the GBS installation, about 5-6 weeks, May-July. The second forecaster, Eric Brozefsky, was mobilized via Wakkanai, Japan on a Heerema vessel and spent about 4 weeks on site. Finally, Francis Kredensor rotated onto the EMAS AMC vessel *Lewek Crusader* and spent about 4 weeks on site until all critical project elements were complete in early September.

The scope of the forecast service entailed preparing a weather forecast every six hours. The meteorologist on duty answered to the Master, to help him make an informed judgment whether to remain connected to the GBS or to prepare for possible disconnection. The forecast also helped them plan daily staffing for the projected work requirements. Briefings were held twice daily, morning and evening, beginning with safety and followed by weather. Evening weather reports

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were especially important, since good weather was needed for lifts. During less-optimal weather, personnel concentrated on subsea work.

The meteorologists were also asked to quantify the probability of abnormal weather occurring, such as the onset of sea fog or rogue waves, and were also responsible for preparing typical marine weather charts.

## Onsite advantage

Brozefsky told OE that the advantage of onsite forecasting is that the meteorologist can observe and interpret any subtle change in weather and update forecast immediately, based on the current trends.

The forecasters relied on shipboard anemometers and weather buoys (wind, current, sea surface temperature), and used markings on the GBS legs to record wave height. Currents were generally light, one-half to one knot.

Meteorology reports included a weather synopsis, graphs, and a table of wind and wave forecasts for 5-7 days out. A benefit of six-hour report spacing was that there was less-dramatic fluctuation between forecasts.

Visibility varied through the season. There was fog almost every day in July, triggered by warm and moist southerly air blowing from the northwest Pacific; its dew point was higher than the colder sea surface temperature, The weather was mostly sunny through August, as sea surface temperature increased and dry air blew east off the Asian continent.

With good visibility, Kredensor noted that those aboard the *Lewek Crusader* could see both the Orlan and Chayvo platforms. In particularly clear conditions, it was also possible to see the top mast of the Molikpaq drilling and production platform, an Arctic caisson operated by Sakhalin Energy Investment Co. Ltd. on the Piltun-Astokhskoye field, part of Sakhalin-II development. Kredensor noted that weather moves faster in the Polar Regions; stronger jet streams cause systems to change rapidly, so forecasting models need constant revision. In August, two decaying tropical systems swept into the Sea of Okhotsk from the northwest Pacific, causing a few days' delay.

Before leaving location, they pulled the weather buoy. The onsite meteorology work concluded the first week of September 2012. Says Brozefsky: "Working offshore can be unpredictable. You have to be flexible."

**Fog obscures the view of the Arkutun-Dagi GBS from the vantage point of the *Lewek Crusader*.** Photo by F. Kredensor

## Safety, logistics

The WWT forecasters' main tools were long-range models, laptops, and personal protective equipment (PPE)!

ENL places the highest emphasis on process safety. Heerema is equally diligent about personal and specific safety. Overall, WWT said there was good oversight, with an environment that encouraged reporting, and a "see something, say something" rule.

Planes and ferries travel between Sakhalin and Hokkaido, and the two regions have good relations, with several towns on Sakhalin twinned with towns on Hokkaido.

Most of the support operations were staged out of Japan; Sapporo has the closest major airport, and Wakkanai, the northernmost city on Hokkaido Island, is closest by sea. Travel from Wakkanai to the Sakhalin operations site required 2.5 to 3 days by ship. All-Nippon Air (ANA) offers service from Wakkanai.

Another mobilization point was Vostochny Port, the largest port in the Russian Far East, in Vrangel, on the coast of the Sea of Japan. The Arkutun-Dagi GBS was constructed in a drydock at Vostochny. This deepwater, ice-free port, at 42° 46' N latitude, operates year-round and encompasses the Special Sea Oil Terminal in Kozmino Bay, Primorsky Krai. Vostochny is at the eastern end of the Trans-Siberian Railway, and Kozmino is the terminal point of the Eastern Siberia – Pacific Meridian pipeline. **OE**

**Online Exclusive:** Sakhalin photo essay, OEdigital.com

## Sakhalin II exports LNG

Sakhalin-II is an integrated, export-oriented oil and gas development, and Russia's first offshore gas project. It handles production from Piltun-Astokhskoye oil field and the Lunskoye natural gas field in the Okhotsk Sea, and is managed and operated by Sakhalin Energy Investment Co. Ltd. Shareholders of Sakhalin Energy include Gazprom (50% +1 share); Shell (27.5% - 1 share); Mitsui (12.5%); and Diamond Gas Sakhalin, a subsidiary of Mitsubishi (10%).

The Sakhalin-2 LNG plant is Russia's first, built at Prigorodnoye in Aniva Bay, 13 km (8.1 mi) east of Korsakov. The oil export terminal is east of the LNG plant on Aniva Bay [see cover photo].

Oil and natural gas now account for 95% of Sakhalin's exports. The first LNG train began shipping in 2000, with 20-year contracts in place, and 60% of production heading to Japan.

When the project reaches full capacity, it is projected to be able to supply 5% of the world's gas supply. ■

# Some like it cold... Arctic

**Interest in the North is strong and growing among international actors—Kåre Storvik gives his views on business in the area.**

Oil companies, supply companies, and service providers to the oil industry are either in place or on their way to the North—to Arctic Europe-to the new, world-scale, oil province.

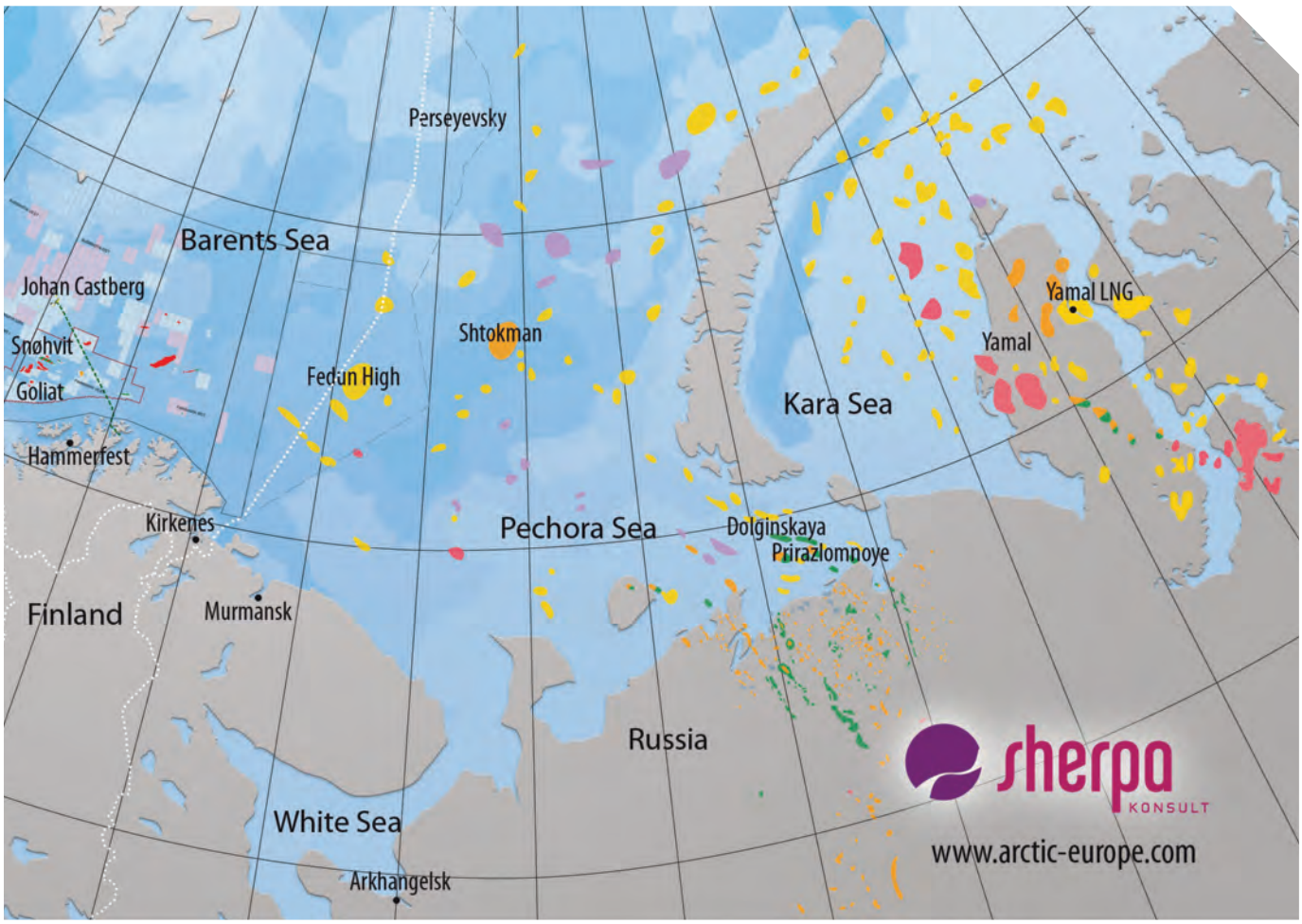
During the next 40 years, we will gradually see that a majority of Norway's oil and gas will come from fields in the Norwegian Sea and the Norwegian sector of the Barents Sea. Resource estimates for northern Norway are getting closer and closer to match the total of all petroleum produced during forty years on the Norwegian shelf.

At the same time, we see resource estimates many times this at our nearby Russian neighbours, offshore and onshore.

## Business challenges

But to develop this knowledge base often takes more time and resources than a contractor may have. Physically, there is no mystery to calculate what effort is needed to work in Russia. But who can run the risk of getting stuck in an unfamiliar bureaucracy with expensive equipment and manpower?

This is when expertise and deliv-




**The existing infrastructure in Arctic Europe.**

# Europe

ery capability of places and ports such Hammerfest and Kirkenes comes into its own. Here we find that capability outweighs the extra distance.

Even Rosneft decided to listen to its suppliers last summer and chose Kirkenes as a base port for its seismic activities in the Kara Sea.

The local expertise and capacity in Norwegian ports have been built up through base and maintenance services to the Russian fleet for 25 years. The main attraction is that the necessary experts, materials, and equipment can be shipped in overnight, taken on board, and used immediately. Also, vessels with advanced instrumentation, which the Russian military may not allow, can be used. When operators encounter technical problems, the details can be addressed immediately, locally—or by overnight assistance from anywhere in the world. It is also beneficial that Norwegian businesses, communities, and infrastructure are aligned with industry standards for health, safety, and environment.

What has been described above in just a few lines makes a world of difference between success and failure.

And that is why development is exploding in Kirkenes. It offers a deep, sheltered harbor, calm climate, and a good airport. Moreover, Kirkenes is on the Russian border, within the forward-thinking, visa-free zone when it comes to Norwegian-Russian cooperation.

To meet new requirements, nearly 1200 acres of new industrial and port areas are being developed for base operations, port activities and trans-shipment, as well as temporary storage of petroleum products,

## Exploration activity

The southern part of the formerly disputed area between Norway and Russia has been licensed to a consortium of Rosneft and Eni. The companies plan seismic surveys for later this year. This area includes the large Fedyn High structure.

The northern part of the formerly disputed area, named Perseyevsky, has been licensed to a consortium of Rosneft and Statoil. The agreement also includes acreage in the Okhotsk Sea, which will be investigated first. Seismic investigations in the Perseyevsky area will take place later.

According to the border treaty between Norway and Russia, any possible border crossing structures will be subject to joint development between the two countries.

### Pechora Sea

According to Gazprom, Gazpromkeft Sakhalin has contracted a Rumanian jackup, *GSP Jupiter*, for drilling at the Dolginskaya field. Both Murmanskaya and Energy Exerter have drilled wells on this field before.

### Kara Sea

Large areas in the Kara Sea have been licensed to a consortium of Rosneft and ExxonMobil. Extensive seismic exploration was carried out last year and will continue this summer. Contractors are Schlumberger and Western Geco using Kirkenes and GAC and Henriksen Shipping, using Unex as base and marine services contractors. British and Russian vessels were employed.

## Production activity

### Shtokman

Shtokman is one of the world's largest offshore gas fields. Estimated resources are 3.8Tcm of gas and 37MMcm of gas condensate.

The field is located in the Russian Barents Sea, 338 nm from Kirkenes and about the same distance from Murmansk, in 320-340m water depth.

Seven wells have been drilled and thorough investigations of different kinds have been conducted. Different concept studies have also been made.

The most recent and detailed study was carried out by Shtokman Development AG, a consortium comprising Gazprom, Total, and Statoil. This study concluded with a technical solution based on a disconnectable FPSO at the field, with loading of gas condensate at the field and pipe transport of the gas to Teriberka, 136km east of Murmansk. From there, part of the gas would be piped to St. Petersburg and part processed into LNG for export.

This concept did result in acceptable economics and led to no investment decision.

Further development favors production of LNG only. The former partners of the SDAG continue to study improved concepts.

### Prirazlomnoje

This is the first commercial offshore oil development in the Arctic, operated by Gazprom. Prirazlomnoje is located in the Pechora Sea, 500 nm east of Murmansk, south of Novaja Zemlja, in about 40m water depth.

Prirazlomnoye field has reserves of 610MMbbl (97MMcm). The estimated maximum annual oil production volume is expected to be 6.6 million tonnes.

The field development concept is based on a single, stationary, ice-resistant platform. The *Prirazlomnoje* platform is being built by Sevmash shipyard in Severodvinsk.

Produced oil will be transported by double-acting shuttle oil tankers *Mikhail Ulyanov* and *Kirill Lavrov*, built in the Admiralty Shipyard and operated by Sovcomflot, to floating storage and offloading vessel *Belokamenka*, located in Kola Bay near Murmansk.

After several years of delay, production will start soon. ■

**The *Deepsea Delta* semisubmersible drilled wells in Shtokman field.**

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other cargo, and pipes and modules for installation in the east. For instance, hard rock aggregates from Tschudi Aggregates are exported to Russia for use both on land and offshore—all the way east to Yamal.

## Seek locals' advice

Interest in the North is strong and growing among international actors. Northern area ports and businesses find it important to build relationships with international oil companies, suppliers, and service providers in order to see and be seen, to hear and be heard, and to take part in the development. It is no longer enough to deal with Statoil.

Therefore Northerners gather together and make annual pilgrimages to the Offshore Technology Conference (OTC) in Houston, Moscow International Oil & Gas Exhibition (MIOGE), Offshore Northern Seas (ONS) conference in Stavanger, and Offshore Europe conference in Aberdeen. We will meet you there for further talks—look for Arctic Europe.

## Logistics

Last year's traffic on the Northern Sea Route (NSR—a shipping lane between the Atlantic and Pacific Oceans above the Russian mainland) increased to 46 ships carrying almost 1.3 million tons of cargo. Obviously, this is only a beginning. High interest ensures that this route will develop quickly—and the development will be an adventure in itself—both for the world's sea routes and the petroleum industry. We have seen petroleum cargo moving in both directions in the past year.

In the future, we will see year-round operation of the NSR. This will be made possible by a fleet of ice-class cargo ships that will be able to plough through winter ice at an acceptable speed without assistance from icebreakers.

These ships will deliver between trans-shipment hubs in ice-free waters in the Barents Sea and past the Bering Strait in the Northern Pacific Ocean. Normal feeder ships will then deliver cargo from the trans-shipment hubs to final destinations.

Annual oil transport from Russia and along the Norwegian coast for petroleum resources greatly exceeds ten million tonnes. The vessels in use are relatively new and have double-hull design.

Trans-shipment hubs in the west include, Kirkenes, or if rail is involved, Narvik. A rail connection between Kirkenes and Finland is also a possibility. **OE**

***Kåre Storvik***
*After a long career in engineering, design, fabrication, and project management, including holding senior roles at Kvaerner, Storvik now provides business development services and project implementation services in Norway and Russia.*

# Russia sets ambitious targets

**With boundless resources, Russia's recent marketing campaigns aim to demonstrate that the country can handle major production efforts from natural gas, oil and LNG fuels.**

By Audrey Leon

Russia's campaign to sell its energy wares throughout the Asia Pacific region continued at several US energy conferences this spring: IHS CERA-sWeek (March) and LNG 17 (April). Russia reiterated that it can curb production declines and ramp up exploration efforts in key areas such as West Siberia and the Arctic.

At IHS CERAWeek, representatives from Gazprom, Lukoil, and TNK-BP joined Fergus MacLeod of BP and Thane Gustafson of IHS for a panel discussion on advancing tight oil and Arctic energy.

Gazprom Neft's Head of Strategy Sergey Vakulenko outlined the company's ambitious plan to double production from 1MMboe to 2MMboe by 2020, with technological advances and international expansion.

Vakulenko says Gazprom plans to deploy technologies that are more commonly used for unconventional oil and gas production to help unlock Russia's conventional resources, by extending the life of mature fields and allowing access to stranded and tight oil formations.

One such technology, ASP Flood, which Gazprom developed with Shell, involves a surfactant flood of chemicals (usually baking soda or dishwashing liquids) to increase recovery by a factor of two, Vakulenko says. Gazprom expects to implement this in West Siberian fields by 2017-2018.

"We believe these new technologies will be main driver of improving efficiencies of existing assets and making new fields production possible," Vakulenko says.

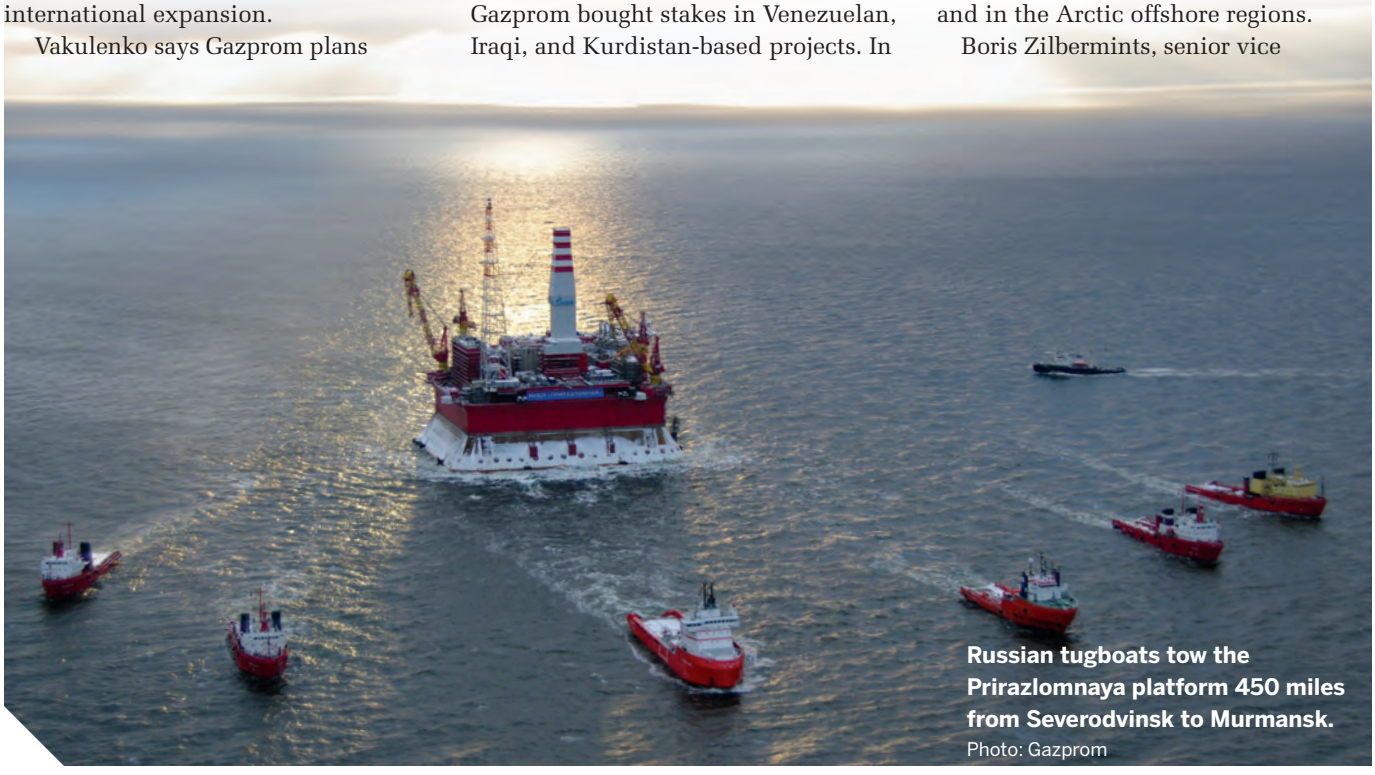
In terms of international expansion, Gazprom bought stakes in Venezuelan, Iraqi, and Kurdistan-based projects. In Venezuela, Gazprom partnered with other Russian firms (Lukoil, Rosneft, and TNK-BP) on the Junin-6 project, in the Orinoco River basin, which may have 50 billion bbl of oil in place with 10 billion bbl recoverable. Production has begun, with two wells already drilled.

Vakulenko also discussed Gazprom's role in Arctic exploration, saying that he expects drilling to begin on the Prirazlomnoye field by this month. Gazprom plans to drill 40 slanted wells at the field, which is located on the Pechora Sea in 19-20m of water. The company estimates the field holds up to 72 million tons of reserves in place, which will enable production of 6.6MTPA. Prirazlomnoye was discovered in 1989. Gazprom expects to produce 460,000 bbls from the field between 2014 and 2020.

Drilling is expected to begin soon at the Dolginskoye field, similarly located in the Pechora Sea. Currently there are two appraisal wells planned between 2013 and 2014. Vakulenko says Gazprom will begin building production facilities in 2015, with first oil from the field expected by 2021.

Lukoil's Andrei Gaidamaka says he is glad technological developments are improving in the Russian industry, which could help the country's energy companies explore tight oil in Siberia and in the Arctic offshore regions.

Boris Zilbermints, senior vice



**Russian tugboats tow the Prirazlomnaya platform 450 miles from Severodvinsk to Murmansk.** Photo: Gazprom

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Elena Burmistrova, Gazprom's deputy general director of oil and gas products, LNG and new markets, speaks at LNG 17 in Houston.

Photo: courtesy of LNG 17

president, international projects and new business development at TNK-BP, discussed Russia's need to urgently develop its Arctic resources, saying that it must be done in the next seven years.

"It hasn't been done in this time frame," he says. "[An] average offshore project takes 10-15 years. Russian companies have never been proficient working offshore. We're accustomed to those challenges and we can increase reserves with new technology."

Speaking at LNG 17 in Houston this past April, Jason Bennett, Moscow-based Baker Botts partner in the global projects practice, told reporters that he expects at least one Russian Arctic LNG project to begin production in the next 10 years.

Vakulenko's counterpart at Gazprom Elena Burmistrova, the deputy general director of oil and gas products, LNG and new markets, told delegates at LNG 17 that despite delays at Sakhalin-2, the company ramped up production efforts last year, operating the LNG plant at 114% capacity. The company is now producing over the 9.6MTPA design capacity.

Burmistrova says Gazprom is looking to expand at Sakhalin and is currently moving through the pre-feed phase for a third LNG train, with completion to follow in July. The company expects to make an investment decision in 3Q 2013.

LNG investments continue with Gazprom's Vladivostok project, located on the west coast of Amur bay on the Lomonosov peninsula. It will be sourced through the company's fields off Sakhalin. Gazprom estimates that Sakhalin-3 contains 49 Tcf of gas resources and 323Bcm of proven reserves. Burmistrova says that the area is a prime location considering its mild climate with no ice in the jetty area, and it already has infrastructure such as direct railway and road access.

Neither Vakulenko nor Burmistrova see Russia pursuing unconventionals within the next decade.

"Conventionals are much more attractive," Burmistrova says. OE

# Kursk tragedy inspires deep-sea diving system design

The Kursk tragedy in 2000 identified a need for a Russian submarine rescue ship after 118 sailors and officers perished when the nuclear-powered, cruise-missile submarine sank in the Barents Sea.

As a response, the Russian Admiralty is constructing the *Igor Belousov*, a rescue ship, to be commissioned in 2014. The ship is to support a variety of rescue missions, which include the search, rescue, and salvage of submarines in distress.

*Igor Belousov* is to be equipped with a deep-sea diving system from Scottish diving equipment manufacturer Divex.

Divex has designed and is manufacturing and supplying the 450m-rated, deep-saturation diving system for Divex's Russian partners, Tetis Pro Ltd., and ultimately for the Russian Admiralty. The system is to be installed in partnership between Divex and Moscow-based Tetis Pro.

The system is a unique design that accommodates 12 divers in saturation, allowing three-man bell excursions to 450m depth to gain access to a stricken submarine. It also accommodates up to 60 rescued submariners in the chamber complex, if any require decompression following rescue.

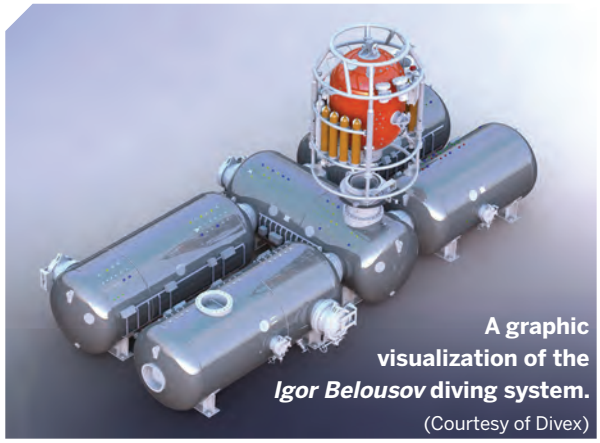
The system comprises four accommodation chambers arranged around a central "transfer-under-pressure" chamber, where divers put on their equipment and access the diving bell. These four chambers accommodate divers at their equivalent working pressure and provide decompression facilities for rescued submariners.

Divex, which has built 100 saturation diving systems since 1974, will split manufacturing between two locations.

The system decompression chambers, diving bell, and control system will be built in Perth, Western Australia, while the bell deployment, life support, and gas management systems will be manufactured and supplied from Divex headquarters in Aberdeen.

All environmental control systems (ECS) equipment will be manufactured at Divex's facility in Cape Town, South Africa, making the system a truly international project.

Final equipment testing will be carried out at the factories. The system is due to be delivered by July, within the 12-month contract window for acceptance-testing readiness. OE



A graphic visualization of the *Igor Belousov* diving system. (Courtesy of Divex)

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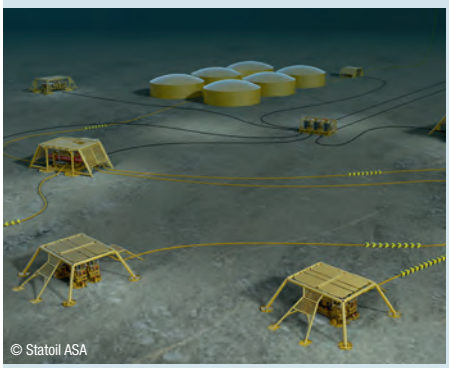

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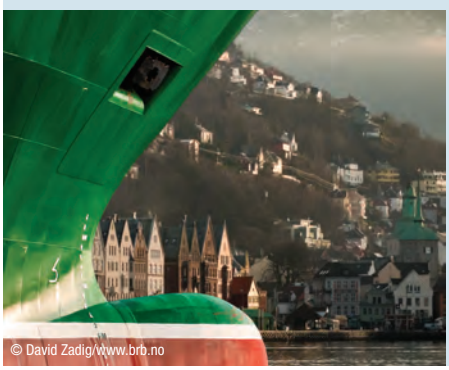

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# Mexico eyes exploration boom

**Pemex wants to grow—but needs the technology and resources to do it. Elaine Maslin reports from Offshore Technology Conference.**

Mexico has ambitious plans for its offshore exploration and production sector. Carlos Morales Gil, general director of Pemex E&P, told a breakfast crowd at the OTC that the state-run firm plans to build more than 60 offshore platforms, between 2014 and 2028, to boost its production.

This includes 31 drilling, 18 production, eight residential, five compression, two treatment, and two service platforms. More than 4000 km of pipelines would also be needed, as well as FPSOs.

In the shorter term, 2013-2017, Pemex wants to maintain oil production at 2.3MMbd-3mmbd and gas at 5.7-6.2MMcfd. To support the planned growth, the country needs resources: human, financial and technological.

## Top 10 producer

Mexico is one of the 10 largest producing countries in the world, Gil says. It is 17th in the world in terms of crude reserves, third among producing companies, and ninth in natural gas production. However, the country has suffered from declining production since 2004, Gil explains.

Production from Cantarell, a super-giant field, plateaued in 2009. Pemex stopped investing in exploration in the 1990s, with the result that reserves have not been replaced.

Exploration restarted in 2004 and Pemex made further moves from 2008-2009, including re-investment in mature fields, to reverse the decline in production.

Now the country is looking to reform the sector in order to promote more foreign investment in exploration and production.

In addition to bringing in new players, Pemex is also looking to diversify its production—exploring and producing in mature areas—but also looking to deep water, unconventionals and heavy oil, Gil says.

> "These projects need three things, which are critical; people, investment and technology. If I have to pick one, people is the most important, because with the right people, the technology will come. This is the critical factor."
>
> Carlos Morales Gil

To achieve its aims, the company plans to increase its investment. Spending on E&P is currently $22billion/yr, he says, but that is to rise to $26billion in 2014, and then to $30 billion in 2015.

Pemex is currently working on 80 projects: 20 in exploration, 29 production-related, and 30 on facilities to produce and transport and distribute oil.

## Need for resources

"These projects need three things, which are critical; people, investment and technology. If I have to pick one, people is the most important, because with the right people, the technology will come. This is the critical factor. Resources are also finite and we have limitations like others."

**Carlos Morales Gil, general director of Pemex E&P.**

Gil says where Pemex lacked capability, it would look for integrated contracts and pay for production. The company is looking to develop its own capabilities through work with research institutions in difficult sandstone reservoirs, enhanced oil recovery (EOR) for heavy oil, and deep water.

In the long-term, Gil noted a specific need for jackups. Between 2014 and 2028, Pemex plans to drill 30,000 wells, he said: 20,000 development wells, 11,000 shale gas/oil wells, and 1180 exploration wells. In addition, he expected 37,000 workovers.

To do this, there need to be more rigs. Between 2008 and 2012, 28 jackups and 27 modular rigs were in use. That will need to increase to 47 jackups and 41 modular rigs, between 2013-2017.

Pemex currently owns and uses 15 modular rigs, with the rest leased. All of the owned modular rigs are over 25 years old and will need to be replaced in the next few years.

### Current projects

GIl says the four most important projects currently being worked on were Tsimin-Xux in the Bay of Campeche (gas and condensate reservoirs due to be subject to about 48 wells and nine platforms); Ayatsil-Tekel and Pit-Baksha ("extra heavy oil" with 30 wells and five platforms), also in the Bay of Campeche; and Lakach, Pemex's first Gulf of Mexico deepwater development, a subsea tieback to shore facilities and likely to be a hub development.

"Some of these fields are in the first quartile in size in the Gulf of Mexico," says Gil. "We are aiming to incorporate more than 400,000 b/d from these resources."

### Lakach—deepwater

Pemex's foray into deep water started in 2004 with the shooting of 3D seismic. Lakach was discovered in 2007 and is estimated to have 866Tcf of 2P reserves. Pemex aims to start production in March 2015, reaching 400Mscf/d in 2016, and a total recovery of 866Tcf by 2025.

The development concept includes six development wells: two 18in.-diameter, 60km transport pipelines; 60km of umbilicals; related subsea equipment and manifolds; subsea monitoring and control systems; and a gas treatment facility onshore.

Other deepwater discoveries were outlined as Piklis and Nen in 2011, Trion, Supremus, and Kunah in 2012. Since the conference, Pemex has made an ultra-deepwater oil discovery at Maximino, with tests ongoing, and it is due to drill PEP 1 in 9580ft water depth.

### Bidding rounds

In order to bring other players into the region, Pemex is planning several leasing rounds.

Bidding for Chicontepec onshore is underway, says Gil. Later this year, there will be a round focusing on mature fields. Heavy oil offshore, at Kayab and Pit, will be the next focus in late 2013 to early 2014.

Farther out, Pemex will offer licenses to produce natural gas in the Burgos basin and shallow Veracruz basin, followed by yet-to-be-defined deepwater areas in 2014, and then shale. OE

# STEM program offers industry insights

By Anthresia McWashington

About 200 students from high schools in the Houston area got a glimpse at what their future in the oil and gas industry might be during the BP-sponsored STEM (science, technology, engineering, and mathematics) event at the 2013 Offshore Technology Conference. Students performed experiments, met with industry leaders, and toured the exhibition floor during the conference, while participating in a scavenger hunt.

Crystal Ashby, VP of Government and Public Affairs at BP, spoke about how BP recognizes the importance of investing in the education and needs of young people, and told them of the need for more of them to join the industry after college.

"These companies look to hire well-educated people who can handle the science and math needed to find energy solutions for the future," says Ashby. "The days of self-taught oil prospectors taking an educated guess and poking something in the ground, looking for oil and gas are long gone. Now an entire range of sciences and technologies are employed by teams of professionals [looking for] resources in remote and often complex environments."

Newly hired BP employees volunteered time taking students around the exhibition floor, and answered questions about their professions. BP financial analyst, Farah Ahmed told participants of the different avenues that the industry has to offer.

"It felt great being able to help out," says Ahmed. "To see the excitement on the kids' faces while they were getting exposed to different areas and learning different things about the oil and gas industry was great."

Ahmed advised students to get a head start on researching career paths they'd like to take before finishing their education.

"Get exposed to as much as you can about the industry," says Ahmed. "That will help you see what kind of sub-disciplines you may be interested in. Definitely make connections with companies, do internships, and see what kind of projects are available. Be very proactive about internships and jobs."

Students completed surveys about their experiences throughout the day, and were given informative materials to take home. Their instructors were also given teaching materials before and after the event, to prepare students for what to expect at the conference, and lessons following up on everything they were able to experience while at OTC. OE

**Students on OTC exhibition floor.**

# The long and winding road to SEMS compliance

**Safety is a necessary practice for all operations, and new regulations for oversight seem to be missing some key components.**

By Audrey Leon

The US Bureau of Safety and Environmental Enforcement (BSEE) released its Safety and Environmental Management Systems (SEMS) II rule in April and the topic remained on the minds of delegates on the final day of the Offshore Technology Conference (OTC).

The SEMS II rule aims to provide greater employee participation, allowing those in the field to identify hazards and stop work if it is unsafe. The rule also sets oversight guidelines, requiring audits to be conducted by accredited third-parties.

The morning session on SEMS II regulations drew panelists from Lloyd's Register, Acu Tech Consulting Group, PEC, and DNV to discuss how operators as well as their contractors could better implement the new safety requirements.

The biggest problem with SEMS II, as presenter Michael Hazzan, of Acu Tech Consulting Group, noted is the lack of outside auditors approved by BSEE, which are required to examine an operator's safety program.

"There are no accredited bodies," Hazzan says. "The Center for Offshore Safety is the likely and preferred candidates, but today they are not one." (At press time, the Center for Offshore Safety selected Bureau Veritas as its official SEMS audit service provider.)

With the lack of approved auditors, comes another problem: when should these audits occur? SEMS I required companies to get their systems in place by last year and submit results by November, and then repeat every three years. SEMS II dictates that third-party audits should be conducted prior to June 2015.

BSEE Director James Watson, who attended the panel, says that companies do not need to wait three years between the second round of audits. The first round of audits are due at the two-year point, and urged companies not to wait until the end of the cycle to conduct the audits as BSEE has final approval and can require additional follow-ups.

While there are kinks that need to be worked out with regards to the rules, Hazzan praised management systems

# Norwegian innovation makes

By Elaine Maslin

When Norway first attended the Offshore Technology Conference in Houston, 40 years ago, it was at the beginning of a long journey. Building on its seafaring heritage, the country has developed a strong base for oilfield technology. It's now leading the way into new territories, backed by state-oil firm Statoil's aim to have a full subsea factory by 2020.

Kåre Storvik led the first Norwegian delegation to OTC in 1973, when then-Crown Prince of Norway, now King Harald, opened the first Norwegian pavilion.

There were about 40 people in total in the delegation, he tells OE. "When Norway first attended OTC in 1973, the Norwegian industry learned a lot and made good contacts."

For Kvaerner, Stovik's employer at that time, 1973 was a big success because the firm won its first offshore job with a Houston-based company: ConocoPhillips.

"That was important. We also saw things that we didn't think would be good enough for the future," Storvik says.

"We saw the enormous manual burden on the drilling deck and over time


**Norway's Crown Prince and Crown Princeess take a tour of Norwegian oil service firms at OTC.**

as a necessity for institutionalizing practices.

"Having the policy is not the hard part; implementing is hard," he says. "Audits are mandatory and there's a chance that you may find something – and that's why people don't like them, but it's an opportunity to find out what is working."

### Extending SEMS to contractors

Pisces Carmichael of Lloyd's Register says SEMS should apply to contractors. She says that BSEE's district reports from the end of 2012 showed 29 accidents were related to human error, of these 54% were with named contractors. Another statistic, this time of medevac rescues in the Gulf of Mexico, showed that of the rescues made, 64% were of service company employees compared to 32% of oil and gas company workers.

Carmichael stressed that contractors need to have an effective HSE process and need to show consistent performance and not just safe work practice (SWP) agreements.

When asked if SEMS II applies to EPC contractors, Carmichael says she believes it does. Director Watson left it more open-ended, saying that BSEE is not yet writing SEMS for contractors; however, SEMS applies to all operations, cradle to grave.

Ken Wells of PEC pointed out that BSEE estimates 90% of those who work offshore work for contractors. There is a definite problem with getting a contractor's safety guidelines to mesh with an operator's own program. Most subcontractors have no legal relationship with the majors and hence do not want to make legal declarations about their safety culture, Wells says.

Carmichael says human error is about a company's safety culture. Wells pointed to the conflicting mind set of "operator dictates, contractor follows, and workers do it" and SEMS II regulations that say workers should stop if they feel a job is unsafe. He says that the best way to target zero accidents is by engaging staff.

Robin Pitblado, of DNV, says a company's top management needs to employ a "management loop idea" called PDCA or plan-do-check-act.

"Safety management systems won't work without leadership," he says. OE

# its mark

in Norway we wanted to automate the drilling derrick. Another area we saw we had to do something was the living quarters."

By the 1980s, the Norwegians were using the Norwegian Continental Shelf as a laboratory, moving into deeper waters, more difficult reservoirs and soil conditions.

"We have also been very active in subsea engineering," he says. "It is really where things have developed, not only the well heads, but also now compression and processing, which we are working heavily on. We are moving platform decks to the seabed, that's like science fiction."

Storvik says Norway was being smart. It produced complex vessels, first having the hulls made elsewhere and then carrying out more complex work in Norway. With developments in welding and automation, the hulls are now being built in Norway, he says. "The idea is we work smarter."

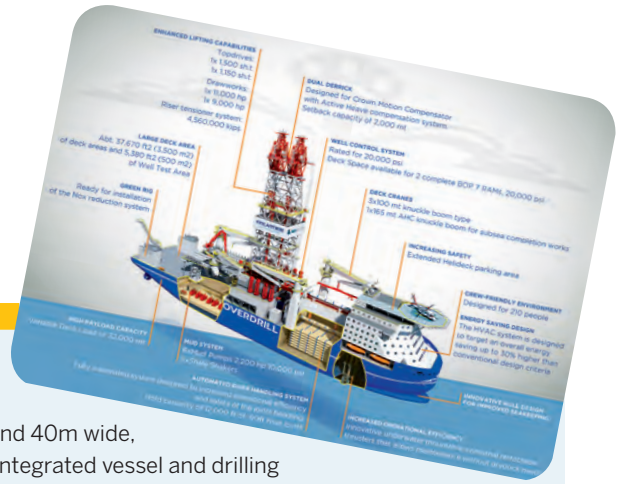
This year's Norway pavilion opening and the anniversary were marked by the attendance of the current Crown Prince and Crown Princess.

Norway's petroleum minister, Ola Borten Moe, also spoke at the pavilion opening, commenting on the achievement of the industry and how it had developed over the past 40 years.

"Fields on the Norwegian Continental Shelf are often in remote areas with no infrastructure in place and in deep waters. Technology development has been necessary to make fields economic. I think this still will be the case in the future. There is a lot more to do and a lot more fields to develop. Norway has developed leading edge technology like subsea compression. Technology development has been important to increase recovery."

However, he says the goal was more. The average recovery rate is more than 40%; Statoil's aim is 60%, which still leaves 40% in the ground. OE

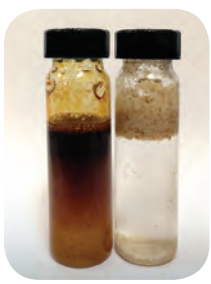
# Solutions




## Partners unveil drillship design

At OTC Fincantieri unveiled a new next generation drillship design, Overdrill, created with support from Norway's Aker Solutions. The vessel, at 208m long and 40m wide, accommodating 210 people, aims to be smaller than existing units through an integrated vessel and drilling equipment design while also increasing the variable deck load capacity. It would be capable of drilling to a maximum depth of 50,000ft, with a dual derrick, manage well pressure of up to 20,000 psi, and have a hook load of 1500-tons, Fincantieri says.

It is designed to come with three knuckle boom cranes, two at 100 metric tonnes and one heave compensated at 165 tonnes. It would also have a fully automated riser handling system, recently designed by Fincantieri and partner Navalimpianti. The firm has also designed retractable thrusters to allow for maintenance from inside the vessel and a recessed moon pool for large Xmas trees. The helideck can also accommodate two helicopters. www.fincantieri.com



## OTC launch for Osorb

Produced Water Absorbents of Ohio launched its Osorb technology at OTC 2013 for the treatment of oil and gas wastewater streams. Osorb is a regenerable granular media, which PWA says removes up to 99% of free, dispersed, emulsified and soluble hydrocarbons, and oilfield chemicals from water, in both on and offshore applications.

It was developed by a professor at the College of Wooster in Ohio and has since undergone field testing through PWA in the US and Far East. Results demonstrated an average 96.2% reduction in Oil in Water (OIW) from 85 to 2.9 ppm (parts per million), PWA says.

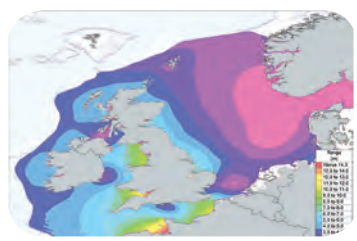
As well as oil, which can then be recovered, it also removes other contaminants and can be applied into containers or injected into a flow stream. It can also remove polymers used in EOR applications, allowing them to be reused. At OTC, PWA also announced a memorandum of understanding with Enviro-Tech Systems, LA, to help promote Osorb as an oilfield service. www.pwabsorbents.com

## Multi-frequency sonar head

Kongsberg Mesotech Ltd announced the release of the 1171 Series Multi-Frequency High-Resolution Fan/Cone Sonar Head.The operating frequency of the cone transducer can be selected by choosing one of four frequencies and the frequency of the fan can be selected by choosing one of three frequencies, or by using "tunable" mode where the frequency can be changed in 5 kHz increments. "This new sonar head operates at high frequency to provide ultra-fine resolution data, delivering image quality similar to Mesotech scanning sonars," says Konsberg Mesotech Product Manager Bogdan Constantinescu. www.km.kongsberg.com/mesotech

## Steel body PDC drill bits

Carrolton, Texas,-based Varel International launched its Katana-series steel body polycrystalline diamond compact (PDC) drill bits. Varel's PDC Product Manager Cary Maurstad describes the line as a definitive enhancement for the company's fixed cutter, PDC product line. Katana includes higher blade stand offs and greater open face volume, patent-pending hydraulic optimization, upwardly-angled troughs in the gauge pads, and a streamlined cutter pocket design. The platform includes SPOT-DN™ cutting structure design and force balancing software, and aerospace-grade CAD/CAM modeling and manufacturing capabilities. www.varelintl.com



## Tidal energy modelling tool

The Energy Technologies Institute (ETI) and HR Wallingford unveiled a tidal energy modelling tool for use by tidal energy developers to identify the most efficient sites for tidal energy converters, tidal arrays, or tidal barrage schemes around the UK and French coastlines. The program, SMARTtide, incorporates a 2D hydrodynamic model of the UK's continental shelf and the northwest European coastline. The tool calculates how energy extraction at one site may affect the energy available elsewhere, and identifies how interactions between different sites around the UK combine to form an overall effect and considers what constraints these interactions will place on the design, development and location of future energy systems. The software will be available to the public as a fee-for-service via a portal on HR Wallingford's website. hrwallingford.com/projects/SMARTtide

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### Who:
**Gonzalo Merchan**
Director – Global Energy Sector
Information Intelligence Group, EMC Corporation
*Gonzalo Merchan, IIG Global Director for the Energy sector, is based in California. Gonzalo brings over 30 years experience in the Software Enterprise Solutions area including 11 years with EMC, 5 years with BEA Systems and over 15 years at senior level positions at IBM and Fluor.*

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# Activity

**SPOTLIGHT**

## IADC North Sea Chapter Safety Awards

**The International Association of Drilling Contractors (IADC)** North Sea Chapter Safety Awards celebrated its member companies for safety performance in 2012. Northern Offshore and Ensco won in the jackups category while Noble Drilling and Stena Drilling were acknowledged for semisubmersibles. Archer Well brought home five awards, including the Chairman's Special. The award recognized Archer's Paul Ellis for safety leadership. "The safety awards dinner is our opportunity to applaud the continuous efforts of our workforce who strive daily to achieve the safest working environment possible," says North Sea Chapter Co-Chairman, Darren Sutherland. "This year's event is particularly noteworthy as we celebrate the Chapter's 40th anniversary and commemorate the 25th anniversary of Piper Alpha – a tragic event that initiated a significant overhaul of the North Sea safety regime."

Sweden based **Trelleborg** acquired the UK company Ambler Technologies Ltd. The company develops and produces composite materials that create strictly specified buoyancy and insulation properties in applications used primarily in deep-sea environments."In conjunction with the transaction, we will create a Center of Excellence focused on advanced buoyancy modules in deepsea environments. We'll be able to offer fully integrated and proprietary solutions to remotely operated vehicles (ROVs) and others equipment used in deep waters," says Fredrik Meuller, president of Trelleborg Offshore and Construction.

**Marine Well Containment Company (MWCC)** selected Mobile, Alabama, as the shore base location to house its subsea umbilicals, risers and flowlines (SURF) equipment. "Should our SURF equipment be needed to respond to a well control incident in the deepwater US Gulf of Mexico, we know that we have the right support in place to respond safely and effectively," says MWCC CEO Marty Massey.

**Tidewater Inc.** has entered into an agreement with HitecVision to purchase Troms Offshore Supply AS for about $395 million. The acquisition will expand Tidewater's global footprint into the Norwegian sector of the North Sea and supplement Tidewater's experience and vessel fleet operating in harsh environments. "This transaction is recognition of the strategy, focus and competence provided by our staff at all levels across the fleet and onshore," says Troms Offshore's CEO Mårten Lunde.

**McDermott International Inc.** acquired all outstanding shares of the DeepSea operating companies. "The acquisition of DeepSea by McDermott enables us to offer a greater number of subsea engineers with broader specialist services to reinforce our own engineering, procurement, construction and installation capabilities in executing subsea projects worldwide," says Stephen M. Johnson, McDermott chairman, president and CEO.

**Total Gabon** contracted two Smit Lamnalco vessels, the *SL Gabon* and *SL Libreville* for a five-year period. The vessels will support offshore oilfield activities and tanker operations at the terminal of Cap Lopez, Port-Gentil. "These two state-of-the-art tugs signify our continuing commitment to invest in the future of Gabon," says Smit Lamnalco CEO Daan Koornneef.

**The *Ramform Titan* seismic vessel is designed to pull 24 streamer cables**

**PGS** unveiled *its Ramform Titan* platform in Nagasaki, Japan. The platform has a 70m broad stern and is equipped with 24 streamer reels, 16 reels aligned abreast and 8 reels further forward. "The *Ramform Titan* will spend her first season working on multi-client projects in the North Sea," says PGS' EVP of Operations, Magne Reiersgård.

**Ecolab Inc** closed its acquisition of Champion Technologies and its related company Corsicana Technologies for $2.3 billion. "Champion strengthens our position in the fast-growing oil and gas services industry. It bolsters our ability to better serve customers by bringing important and complementary geographic and technology strengths to our Global Energy business," says Ecolab Chairman and CEO, Douglas M. Baker, Jr.

**DeepOcean UK**, a subsidiary of DeepOcean Group Holding BV, announced that it has acquired a 50% interest in 3D sonar visualization firm, ADUS, to form ADUS DeepOcean Ltd. Bart Heijermans, DeepOcean Group Holding BV CEO says, "This acquisition enhances the quality of the services we offer to our customers in the oil & gas and renewables industries. As part of this acquisition ADUS will commit to a R&D program to further develop the visualization software used by ADUS."

# On the Move

By Audrey Leon

## Christopher Wiernicki, new chairman of ABS and ABS Group, celebrates 20 years this year

Last month, **Christopher J. Wiernicki**, President and CEO of ABS added the title of chairman to his credentials after the boards of both ABS and ABS Group of Companies announced the dual appointments. He replaces former chairman Robert D. Somerville who retired on April 30 following 43 years with ABS.

The new roles come as Wiernicki celebrates 20 years with the company. He joined ABS in 1993 as vice president of engineering within ABS Americas Division. He eventually served as president and COO of ABS Europe Ltd., chief technology officer, and president and COO of ABS Group of Companies, Inc.

Wiernicki says that ABS first popped up on his radar screen in college, and eventually he earned an ABS scholarship. He holds a BS in Civil Engineering from Vanderbilt University, an MS in Structural Engineering from George Washington University and an MS in Ocean Engineering from Massachusetts Institute of Technology. Wiernicki is also a graduate of the Harvard Business School Advanced Management Program.

"I knew that as a naval architect, I wouldn't find another organization in this country with the same exposure to offshore, marine, and government," he says. "When I joined the company, I realized how much it had changed during its 150 years and had improved through its ability to adapt and thrive."

While job hopping is common in the industry, Wiernicki found ABS' commitment to preserving safety, property, and the environment reasons to stay put for the long-haul.

"It is an organization that has shown technology leadership and innovation on a grand scale. That excites me and energizes me every day," he says.

What currently excites Wiernicki are ABS' global technology centers, which he calls a 'cornerstone of our global ecosystem for innovation.'

"The changing offshore environment guarantees that demands on technology will increase. A key focus will be to enhance and expand our global network of technology centers because they facilitate partnering with industry, academia, and government in vital R&D work that will help the industry move safely into new and challenging areas," he says.

Wiernicki says ABS aims to grow its international presence with these investments, and he is enthusiastic about markets in Brazil, Singapore, China, Africa and Mexico.

"I am convinced that the future of offshore safety will be equally technical above and below the waterline; so ABS will be investing in a broad range of R&D projects. We are developing next-generation safety systems related to automation and control and are developing in a number of products that facilitate software integration," he says.

After two decades in ABS' management, Wiernicki says he has learned that while markets and business drivers may change, people do not.

"It is important to invest in them, to provide growth opportunities, and to continually look ahead in terms of defining and grooming the next generation of leaders," he says. "Succession planning is critical and talent management is more important today than ever before." OE

## CEO Updates

Chesapeake Energy Corp. chose **Robert Douglas Lawler**, Anadarko's senior vice president of international and deepwater operations, to replace Aubrey McClendon.

**Svein Arild Killingland** joins Norwegian Energy Co. (Noreco) as its CEO, succeeding Einar Gjelsvik.

**Bjørnar Iversen** takes over as Songa Offshore's CEO, replacing interim chief Jens Wilhelmsen.

State-owned Egyptian General Petroleum Corp. (EGPC) named **Tarek El-Barkatawy** its new CEO, replacing Sherif Haddara, who was appointed oil minister last month.

Treaty Energy Corp. named **Max Mohamed**, former vice president of Stonegate Operators, president and CEO of Treaty Belize Energy, Ltd.

**Nezar al-Adasani** replaces Faruq al-Zanki as CEO of Kuwait Petroleum Corp.

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# Advertiser Index



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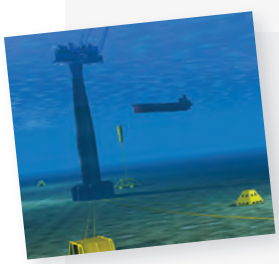
# Numerology

**6,000,000,000** The barrels in place at the Julia field in the US Gulf of Mexico. *(Source: ExxonMobil)*

**11.4%** Of US crude oil imports come from Mexico. *(Source: US Energy Information Administration)*

**2014** Year the new Oblique Icebreaker Arc 100 is due for delivery to Russian Ministry of Transport. *(Source: Aker Arctic Technology)*



**20** Years Shell's Draugen field in the Norwegian Sea has been in production. ▶ See Draugen page 35.

**167** Men died during an explosion and fire onboard the Piper Alpha platform in 1988. ▶ See 'Analysis' page 21.

**2020**

Russia's Gazprom aims to double production to 2MMboe. ▶ See 'Russia Focus' page 48.

**1,600,000** Storage capacity, in bbls, of Petrobras' FPSO Cidade de Ilhabela now under construction. *(Source: SBM Offshore)*

US BSEE SEMS II regulations were released in April. ▶ See OTC Review page 62.

**15** The number of gasoline formulations refiners produce in the US to meet state and local fuel standards. *(Source: American Petroleum Institute)*

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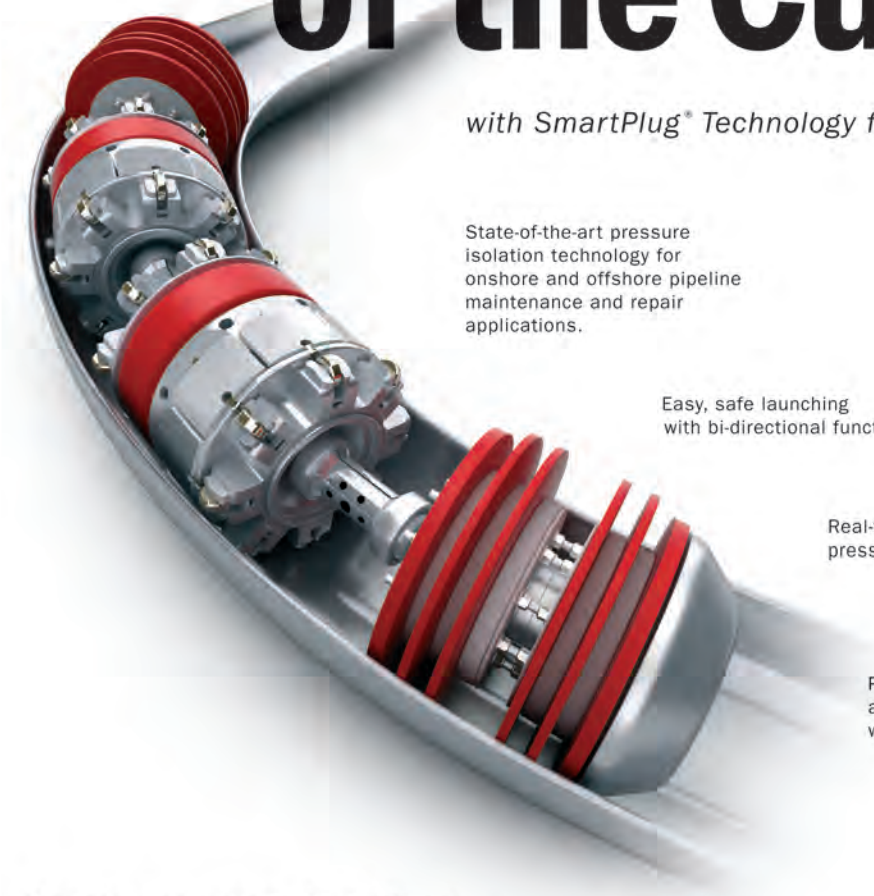

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