

GEOLOGY & GEOPHYSICS

- 34 Supporting seismic in the Gulf of Mexico**
Vincent Vieugue addresses the issue of information gaps when evaluating the probability of success and estimating reserves in prospective fields.
- 38 Barents Sea FTG**
Dr. Stephen Ripington, Dr. Neil Dyer, and Chris Anderson explain how Full Tensor Gravity Gradiometry (FTG) is aiding prospect evaluation in the Barents Sea.

DRILLING & COMPLETIONS

- 42 Benchmarking reliability**
The capability to benchmark the reliability of safety-critical well barrier components against a global component test database will enable oil and gas operators to optimize asset performance, Ged Lunt says.
- 44 Taking well control training to new levels**
Steve Redgrave, Director of Aberdeen Drilling School, discusses new recommendations for well control training practices in the wake of Deepwater Horizon.

EPIC

- 46 Restarting Rhum**
Elaine Maslin reports on the task of restarting the North Sea Rhum field by BP Engineers in 2014.
- 50 Unlocking marginal fields**
Ben Smith and Ed Randall look at the options and challenges of finding economically viable ways to develop marginal fields, in the UK North Sea and further afield.
- 54 Great expectations**
Meg Chesshyre learned more about engineering software at the Bentley Systems' Year in Infrastructure 2014 conference in London.

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- 58 40 years rigless: where are we now?**
Fernando Hernandez demonstrates the evolution of vessels, equipment, and methods to meet contemporary demands of RLWI.

SUBSEA

- 62 Call for more developed ROV classification system**
As ROVs are given tasks in more and more challenging environments, there has been a call for the industry to develop a classification system. Meg Chesshyre reports.

PIPELINES

- 64 Reel-lay gets real attention**
The race has been on to create a mechanically-lined pipe, which can be installed using reel-lay. Now it's been done, and the method is taking off. Elaine Maslin provides an overview.

MIDDLE EAST

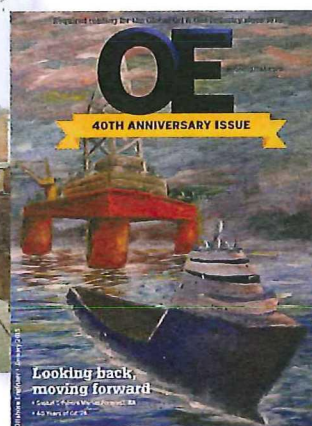
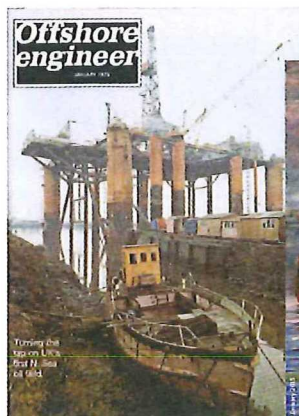
- 68 Middle Eastern promise**
The shallow waters of the Arabian Gulf belie the plethora of offshore infrastructure – new and old – in the Middle East. Elaine Maslin probes beneath the waves.
- 72 Leviathan looms**
Sarah Parker Musarra examines Israel's Leviathan field's potential and separates fact from misconception.



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Global Offshore Market Forecast

- 28 The floating production outlook for 2015**
Infield Systems's Catarina Podevyn provides analysis on floating production projects around the globe and the impact they will have on individual regions this coming year.
- 30 Subsea infrastructure – growing and moving deeper**
Subsea hardware spending in 2014-18 is forecast to nearly double the size of installed subsea infrastructure, according to Douglas Westwood's latest estimates. Matt Loffman sets out the detail.
- 32 Different risk profiles among deepwater projects**
GlobalData's Adrian Lara sheds light on the kinds of deepwater projects expected to advance while the price of oil continues to fall.



ON THE COVER

Next generation. As OE turns 40 this year, we wanted to pay homage to our very first cover depicting Britain's first offshore oil field, Argyll, which similarly turned on its taps in 1975. This portrait, painted by Sage Hansen – a 3D animator at NOV who contributed our June 2014 cover – recalls the scene from 1975 and updates it with more modern, next-generation equipment.

"What is the biggest challenge facing the global offshore oil and gas industry in 2015?"

11 Voices

Our sampling of leaders offers guidance.

12 Publisher's Column

Blast from the past. Brion Palmer reflects on the year that was... 1975.

14 ThoughtStream

John Drake of Ake Group lays out the global risk outlook for 2015.

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News from the around the world, including discoveries, field starts, and contracts.

23 In-Depth: Current Complexities

Elaine Maslin reports on how some companies are attempting to better understand the region west of Shetland.

66 Automation

Gregory Hale reports on how new age technologies block failures, and boost bottom line.

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75 Activity

Company updates from around the industry.

76 Spotlight

This month, to mark OE's imminent 40th anniversary, we're putting OE in the Spotlight.

78 Faces of the Industry

Kelli Lauletta profiles Statoil VP Helge Hove Haldorsen, who officially takes the reigns as the 2015 Society of Petroleum Engineers (SPE) President.

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GEOLOGY & GEOPHYSICS

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Golder Associates' Ken Been explains the best approach to geotechnical engineering and pipeline construction when facing scours and pits underneath Arctic ice.
- 38 A sinking feeling**
Elaine Maslin reports on subsidence challenges faced by ConocoPhillips at Ekofisk.

DRILLING & COMPLETIONS

- 42 Industry set for new MPD guidelines**
Jerry Lee reports on new guidelines for managed pressure drilling operations due out this year from both ABS and API.
- 46 Influx detection**
James Onifade discusses kick detection and circulation on the first managed pressure drilling operation for an African operator.

EPIC

- 48 Mapping a platform**
Laser scanning using hand held devices and then seeing the information real-time on offshore-approved tablets is coming, says Carl Bennett and Stewart Buchanan.

PRODUCTION

- 50 Conversion work**
Alan Thorpe gives a rundown of some of the current floating production and storage unit conversions underway in Singapore and Malaysia.
- 54 Out of sight, Out of mind**
Peter Beales discusses the dangers of neglecting software integrity.

SUBSEA

- 56 Aegir's first project**
Heerema Marine Contractors' new multipurpose construction vessel, *Aegir*, completed its first job in the Gulf of Mexico, reports Meg Chesshyre.
- 58 Alliance creates results**
Elaine Maslin reports on the fruitful subsea production alliance between Aker Solutions and Baker Hughes.

PIPELINES

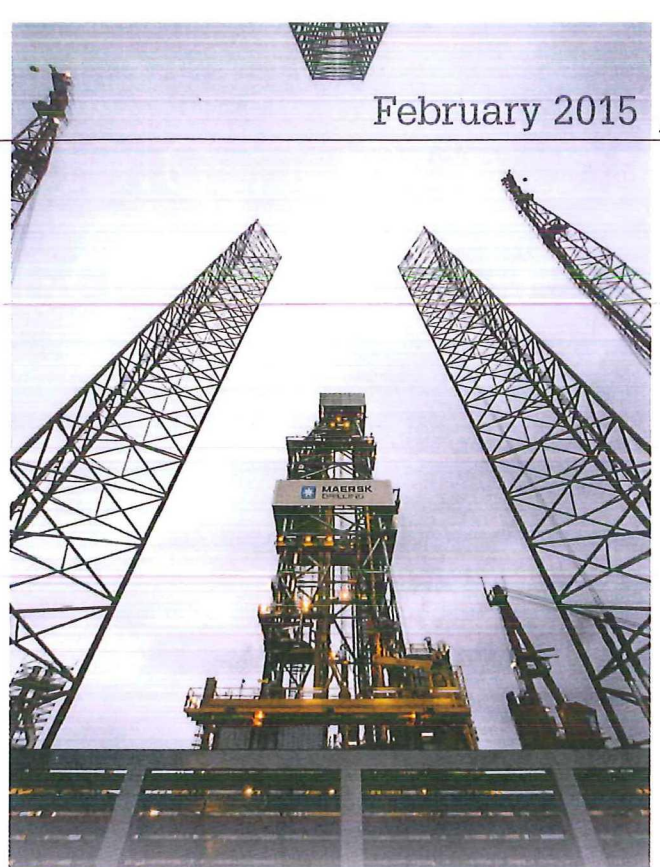
- 60 Tension in the deep**
David Tibbetts speaks about the methodology behind the design of the new 120-tonne tensioner from Aquatic Engineering & Construction due in 2015.

SPECIAL REPORT: PIETER SCHELTE

- 62 Pieter Schelte arrives in Rotterdam**
A unique and long-awaited sight arrived at one of Europe's busiest ports early January – Allseas' 382m-long, 124m-wide platform installation/decommissioning and pipelay megavessel *Pieter Schelte*.

GEOGRAPHICAL FOCUS: EAST AFRICA

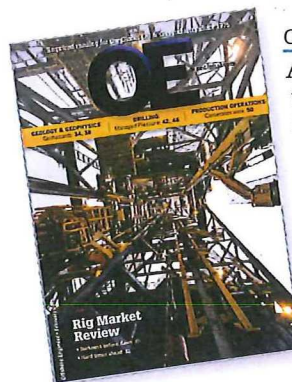
- 66 Offshore East Africa: what's next?**
Jeremy Berry explains what might happen next in this new hydrocarbon province.
- 68 Challenges in the deep**
Alex Hunt takes a look into the challenges around getting offshore East African gas to shore.



Feature Focus

Rig Market Review

- 30 Deepwater drilling markets – Darkness before dawn**
Rystad Energy's Joachim Bjørnin and Oddmund Førø discuss challenges to rig operators in 2015.
- 32 Rig market hits hard times**
ABS' James Graf explains how order books reflect reined in spending based on conservative near-term oil price estimates.



ON THE COVER

Alternate view. As we consider the health of the rig market, we feature Maersk Drilling's DNV-classed Maersk Interceptor on the cover. The Gusto MSC CJ70-X150MD, ultra-harsh environment unit is to work on Det norske's Ivar Aasen development in the Norwegian North Sea under a five-year contract. *Photo from Maersk Drilling.*

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Is there a silver lining?

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Our sampling of experts offer opinions.

"What emerging technology will have a direct impact on the offshore market?"

12 ThoughtStream

Mike Tholen of Oil & Gas UK discusses how the falling oil price is effecting the North Sea sector.

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23 Analysis: Lighting the way

Elaine Maslin reports on sending electricity to offshore installations on the Norwegian Continental Shelf from onshore.

28 Analysis: Egypt's bid to spur oil, gas activity

Patrick Werr reports on how Egypt's bid to pay off its debt to international oil companies and improve contract terms could create a rush of activity to make up for lost time.

64 Automation

With oil prices depressed, Greg Hale argues that automation could make a much needed difference in the offshore industry.

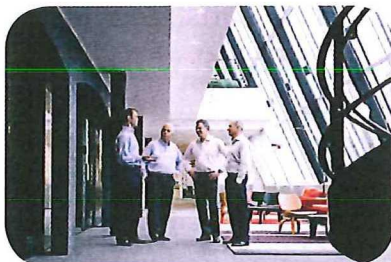


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76 Spotlight

Elaine Maslin speaks with ITF chairman John Wishart.

78 Faces of the Industry

Kelli Lauletta profiles C-NAV dynamic positioning technical advisor Fernando Hernandez.



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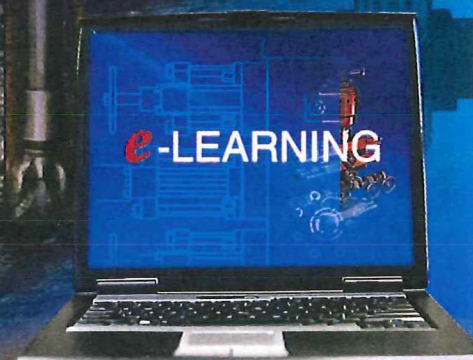
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GEOLOGY & GEOPHYSICS

30 What lies beneath

Dan McConnell explores the geotechnical knowns and unknowns in the Gulf of Mexico.

DRILLING & COMPLETIONS

34 RED gets ready

Resonance enhanced drilling (RED) could help speed up drilling time and efficiency. Elaine Maslin reports.

EPIC

38 Getting to grips with grout

Grout is taking on new forms to meet the needs of offshore wind applications. Jim Bell explains.

40 Seafloor tools

Susan Gourvenec provides a toolbox approach for optimizing geotechnical design of subsea foundations.

PRODUCTION

44 AIM for life – and beyond

Floating production systems are on the hard edge of asset integrity management, Jonathan Boutrot, Offshore Development Manager, Bureau Veritas, explains.

SUBSEA

48 Leap of faith

Will subsea tech join fracking slowdown? There may be too much momentum. Bruce Nichols reports.

PIPELINES

52 Going with the flow

Flow measurement isn't always foremost in industry debates, but the role it plays – and getting it right – is key. Elaine Maslin found out more.

GEOGRAPHIC FOCUS

56 Australian and New Zealand offshore exploration

Wood Mackenzie's Angus Rodger and Matt Howell, discuss the exploration environment for Australian and New Zealand projects as well as the potential impact from the recent fall in oil prices.



Feature

Intelligent Oilfield

24 When automation, not if

Automation on the drillfloor has been slow to take off – but it is coming as advances in enabling technologies are made. Elaine Maslin looks at work ongoing in the field.

26 Learning lessons learned

Is the oil industry good at lessons learned, but not at learning lessons? – Jan-Erik Nordtvedt, SPE Intelligent Energy program committee chair 2014 and President and CEO of Epsis, poses the question.

28 Transforming the future of oil

Repsol's Director for Exploration and Production Technology Santiago Quesada discusses the company's partnership with IBM aimed at developing cognitive technologies for better decision-making.



ON THE COVER

Long-awaited. In mid-February, Statoil and partners reached a final investment decision on the 2.35 billion bbl Johan Sverdrup field, located in the Norwegian North Sea. Discovered in 2010, the field's development is a major success given the current reduced CAPEX climate. Wood Mackenzie recently valued the field at US\$11.2 billion.

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"Are processes in place to fully utilize digital oilfield technologies and if not what more needs to be done?"

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Our sampling of leaders offers guidance.

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Professor Alex Kemp discusses the impact of low oil prices and activity on the UK Continental Shelf.

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16: Field of View: Constructing Mariner

Meg Chesshyre checks in on the Mariner project's progress.

21: In-Depth: Back to basics

Getting engineering back to basics isn't just about standardization anymore. Industry executives at the annual GE Oil & Gas summit in Florence advocated for simplicity in order to keep costs low and get projects done right. Elaine Maslin reports.

58: Automation

Greg Hale looks at ways automation can advance recovery efforts.

60: Solutions

An overview of offshore products and services.

62: Faces of the Industry

Kelli Lauletta profiles Jim Britton, CEO of Deepwater Corrosion Services.

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DRILLING & COMPLETIONS

42 Inflow control

Reservoir engineers are getting to grips with automatic flow control devices, explains Benn A Voll, Ismarullizam Mohd Ismail, and Iko Oguche.

EPIC

46 The harsh reality for materials

Wood Group Kenny's Luis F. Garfias outlines the challenges relating to material selection and testing for eventual use in harsh environments.

PRODUCTION

50 Intervening on Pompano

Audrey Leon reports on the unique challenges Stone Energy faced while attempting to revitalize its Pompano field.

SUBSEA

54 RWLI makes its mark

Elaine Maslin reports on the growing acceptance of riserless light well intervention for well interventions.

PIPELINES

58 Inflatable support

Chris Sparrow shows how using inflatable buoyancy for pipelaying operations could result in shallow-water savings.

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62 Spotlight on Latin America

Heather Saucier examines the effect of regional energy policies on Latin America's rich untapped resources.

66 Big spending needs investment

Elaine Maslin reports from Subsea Expo on Brazil's need for technology investments as it move into deeper waters.



Feature Focus

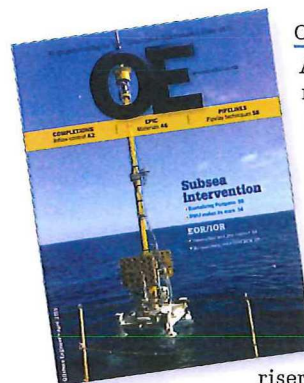
EOR/IOR

34 Understanding EOR

Elaine Maslin speaks with scientists at the University of Aberdeen to discover what more needs to be done to benefit from EOR.

38 Exploring MEOR

Jerry Lee takes a look at some of the research surrounding microbial enhanced oil recovery (MEOR), and how it could be a viable solution for increasing recovery efforts.



ON THE COVER

Adaptation. When Stone Energy needed assistance intervening on its subsea well template at the deepwater Pompano field in the Gulf of Mexico, the company worked in collaboration with Cross Group to find a solution that would allow access to the field's through-flowline subsea system. The end result allowed flexibility for both riserless or riserless intervention. See more of the story on page 50 of this issue of *OE*.

Departments & Columns

"What changes do you expect to see in Mexico's offshore energy industry in the next five years?"

11: Voices

Our sampling of leaders offers guidance.

12: Undercurrents

When it comes to new technology the standard in the industry is to avoid being first.

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Craig May, managing director, Chevron Upstream Europe, discusses EOR technology.

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20: Field of View

David Smith explains West Delta Deep Marine's continuing expansion off Egypt.

25: In-Depth: Oceangoing giants

Rotterdam was home to three giants of the sea in early March. Elaine Maslin took a tour.

31: In-Depth: Resetting the industry

2015 is a bleak year with tough budgets, but solutions were suggested at IP Week, Meg Chesshyre reports.

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Expanding on the Industrial Internet of Things.

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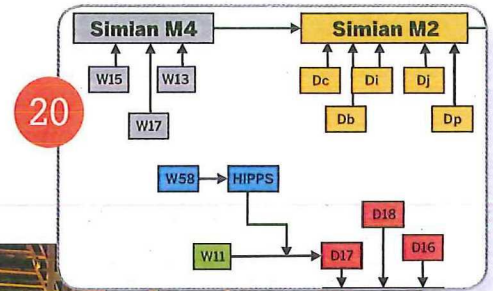
Elaine Maslin speaks with Kristian Siem, founder and chairman of Siem Industries.

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Exploration isn't just about the seismic, it's about joining up the petabytes' worth of seismic dots. Meg Chesshyre reports.
- 48 Structural modeling in unconventional reservoirs**
Efficiency, cost-effectiveness and optimized analyses are crucial in upstream asset development. Jeannie Stell explains.

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Halliburton Energy Services' Harvey J. Fitzpatrick, Jr. shows how wellbore stimulation fluids can increase production.
- 56 Advances in technologies for additives and fluids**
Mark Luyster of TBC-Brinadd provides an overview of recent fluid advances for the completion phase of deepwater projects.
- 62 Laser-like precision**
Jerry Lee and Greg App examine how lasers could be used not just for drilling, but for completions and well intervention projects, too.
- 66 From Russia with tough love**
Elaine Maslin explains the use of chemical vapor deposition of tungsten carbide on TSP diamonds for hardfacing.

EPIC

- 68 (Em)Bracing innovation**
By taking onshore cable stay engineering design concepts for use subsea, the Siri platform will be able to continue production. Elaine Maslin takes a look.
- 70 Taking the load**
Elaine Maslin reports on the new solution found to calibrate the 64 load cells on the Snore A tension leg platform.
- 72 Safety from a design consideration**
Preventing corrosion is necessary to avoiding production failures. Leokadia Rucinski and Genesis' Binder Singh provide details.

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- 76 Offshore heavy oil economics**
Jeannie Stell looks at offshore heavy oil development economics with an eye on the current low-price environment.
- 78 Developing KMZ**
Jerry Lee provides an overview of Mexico's Ku-Maloob-Zaap (KMZ) field in the Bay of Campeche.
- 80 Making light work of sand removal**
Desanding to stop wellbore tubing clogging-up is nothing new but company FourPhase has developed their own technology to keep the flow going. Neil Meldrum explains.

SUBSEA

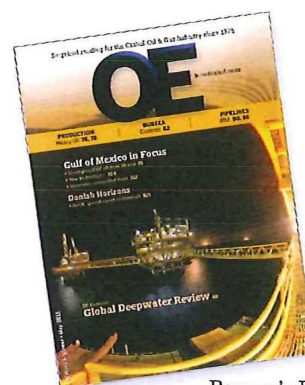
- 82 Building blocks for a subsea future**
Electronic subsea control modules are being designed to go deeper – and be smaller and lighter. John Bradbury takes a look.
- 82 Enhanced IM of subsea control systems**
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- 86 Putting hydrates under high-pressure**
BOURBON is using high-pressure water jet cleaning as an alternative to methanol/glycol cleaning in open water.
- 88 All terrain trenching**
Subsea trenching has become more versatile with Fugro and SMD's Q1400. Fugro's Mike Daniel explains.



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Global Deepwater Review

- 40 Short-term uncertainties in the deep**
Infield systems' Catarina Podevyn takes a look at recent oil price movements and market conditions on the deepwater (500m+) capex spending up to 2019.
- 44 Carry on carbon**
Carbon fiber rods are the way forward for providing umbilicals in deepwater applications according to one leading subsea contractor. John Bradbury explains.



ON THE COVER

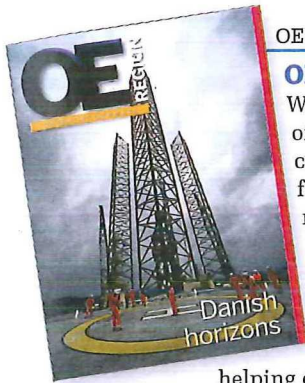
Bright lights, big platform.
This month's cover features

Pemex's Ku-S Central Processing Installation and its bridge-linked satellites in the Ku-Maloob-Zaap oilfield in the Bay of Campeche, Gulf of Mexico. OE's Jerry Lee provides an overview of how the field was developed on page 78.

Photo courtesy of Return to Scene.

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- 90 Plastic fantastic**
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- 96 Shallow water hazards**
Elaine Maslin reports on the challenges of protecting, inspecting and repairing pipelines in the shallow waters of the Middle East.
- 98 Ensuring the integrity of fatigue-sensitive SCRs**
Denise Smiles, of Optical Metrology Services, discusses how to correct internal HiLo misalignment between butted pipes.
- 102 Increasing the tension**
Elaine Maslin discusses Maritime Developments' first four-track 75-tonne pipeline tensioner.



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OER3 A wide horizon
With its rich maritime heritage, the Danish offshore industry still finds ways to expand, create value and produce profitable returns for its customers, says Offshore Denmark managing director Mogens Tofte Koch.

OER4 Danfoss driving subsea pumping technology
The subsea factory could be here sooner than many believe and Danish firm Danfoss is helping drive the innovation that will make it happen. Emma Gordon reports.

OER6 Drilling deep
Maintaining a modern fleet with long-term contracts while setting drilling records is Maersk Drilling's way of doing business. Eloise Logan spoke to the firm's chief technology officer.

OER8 Innovation in intervention
Welltec's well tractor has transitioned from an unlikely vision to a solid reality now deployed in deepwater wells. OE explains.

OER10 Harnessing energy
DONG Energy has taken on the offshore wind market—and it is winning. Elaine Maslin explains.

OER11 A tight grip on pipehandling
Pipehandling can be costly if it goes wrong. e-l-m Kragelund is ready to take its pipehandling solution to the global market place.

OER12 Rigtools eyes expansion
Danish entrepreneurs are taking on the rig tool market. Emma Gordon explains.

OER13 Ramboll spreads its American wings
Engineering firm Ramboll is bringing its Danish values to its newly acquired American businesses. Meg Chesshyre sets out the details.

OER14 P-scan goes deeper
Exploration in deeper waters is driving technology development, not least in subsea inspection. Meg Chesshyre reports.

OER15 Ice spurs innovation
Viking Life-Saving Equipment is taking PPE to the limit. Meg Chesshyre explains.



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Gulf of Mexico in Focus

- 104 Spotlight on the Gulf**
Ultra-HPHT, other technologies advance despite oil price drop, but actual deployment in Gulf of Mexico could slow. Bruce Nichols puts it in perspective.
- 108 Tracking floating production in Mexico**
Bruce Crager profiles some of the floating production units already in use offshore Mexico, and highlights what is yet to come.
- 112 Red Hawk spar flies home**
InterMoor's Dusan Curic discusses the decommissioning of Anadarko Petroleum's Red Hawk spar in the US Gulf of Mexico.
- 116 EMAS makes waves in the Gulf**
Audrey Leon reports on EPCIC contractor EMAS AMC investment in the Gulf of Mexico and its marine base in Ingleside, Texas.



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Peter Welander shows how a solid cyber plan will buttress safety and uptime.

144 Security seeks parallel existence with safety
Greg Hale highlights the importance of both safety and following proper security protocols.

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34 Modeling deeper waters

OE spoke with Schlumberger's Alexander Neber to discuss how software can solve reservoir engineering and other deepwater exploration challenges.

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36 Seeing double in the deep

Elaine Maslin takes a look at Fincantieri's latest ultra-deepwater drillship design – Proxima.

EPIC

38 Creating a severe-weather riser system

Jeannie Stell reports on how BP is working with Wood Group Kenny to design and manufacture an FPSO riser suitable for "dark and stormy" weather.

PRODUCTION

42 Fit for HPHT

Exova Group's Stuart Bond details how the company is working with the offshore sector to develop testing technologies to make sure SURF components are fit for HPHT and H₂S service.

SUBSEA

46 Pushing limits on the line

John Bradbury reports on new equipment designs for risers and umbilicals from DeepFlex and Technip.

PIPELINES

48 Going with the (model) flow

Modeling flow assurance regimes is no easy task, not least for long distance tiebacks, where the need for accurate modeling is crucial. Alexander Belkin outlines a model he has worked on.

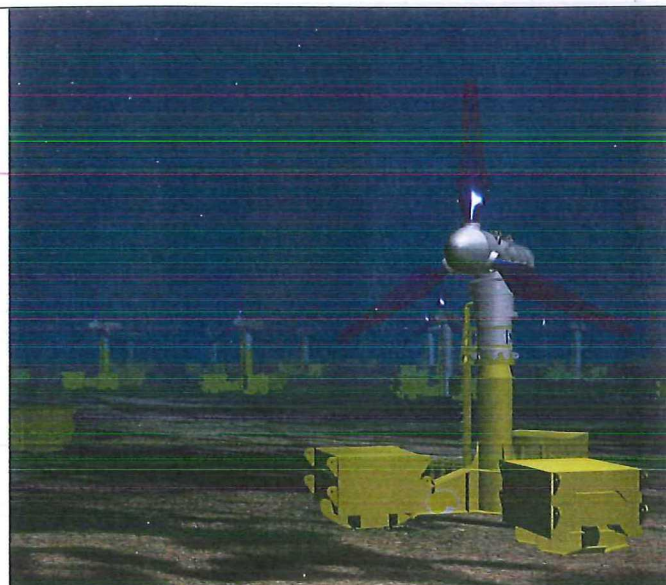
GEOGRAPHICAL FOCUS: ARCTIC

50 Sea of uncertainty

With a mean estimate of 23.6 billion bbl of undiscovered, technically recoverable conventional oil in the Beaufort and Chukchi seas, the Arctic could be one of the last big finds. Heather Saucier examines what is at stake on the US side.

54 Defrosting Arctic development

Russian arctic oil exploration is facing an uphill battle against international sanctions and low oil prices. Eugene Gerden examines why the country's oil companies and government are still keen to find produce their icy black gold.



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Offshore renewables

26 Uncharted waters

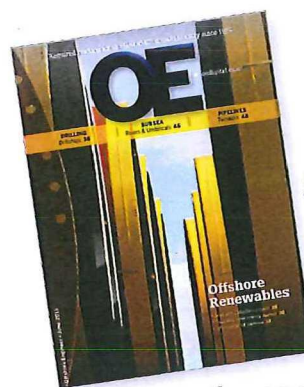
A milestone is about to be reached in the tidal energy industry off the cold harsh coast of Scotland. Elaine Maslin spoke with the project director behind the MeyGen tidal array development.

30 Realizing potential

Tidal and wave energy projects are getting grid-wet this year, yet there's still more to learn. Emma Gordon reports from All Energy.

32 Picking up wind

Douglas Westwood's Rachel Stonehouse discusses the offshore wind market, where approximately US\$330 billion could be spent in capex over the next 10 years, with cumulative capacity surpassing 57GW.



ON THE COVER

Offshore wind turbine foundations await their future deployment offshore at Bladt Industries' 35 hectare, coastal yard in Aalborg, Denmark. Bladt Industries' has been involved in the fabrication of more than 1300 foundations for the European offshore wind market. Photo by Tenna Hørby from Bladt Industries/bladt.dk.

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Forty years ago this month, after a frenzy of exploration and something of a race to be first, first oil was produced from the UK North Sea.

"What will it take to make offshore renewables cost-effective?"

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European Marine Energy Centre CEO Neil Kermode discusses wave and tidal technologies' global market development and standardization.

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Elaine Maslin examines how Statoil and ExxonMobil are seeking to develop the multi-trillion cubic feet of gas resources the two have found in Block 2 off Tanzania.

23 In-Depth: Closing Mexico's deepwater gap

Following Mexico's historic energy reforms, Fernando C. Hernandez, of Reaching Ultra, discusses what is still needed in order to make Mexico a major deepwater player.

56 Automation

Gregory Hale walked the aisles at this year's Offshore Technology Conference to find out what moves the industry is making toward automation.

58 Countdown to SPE Offshore Europe

Inspiring the next generation sets the theme for this year's SPE Offshore Europe 2015. *OE* takes a look at what's in store at this year's event.

62 Spotlight

Tim Cornelius, CEO Atlantis Resources, outlines how the success of MeyGen will help lay the ground work for the future of the tidal power industry.

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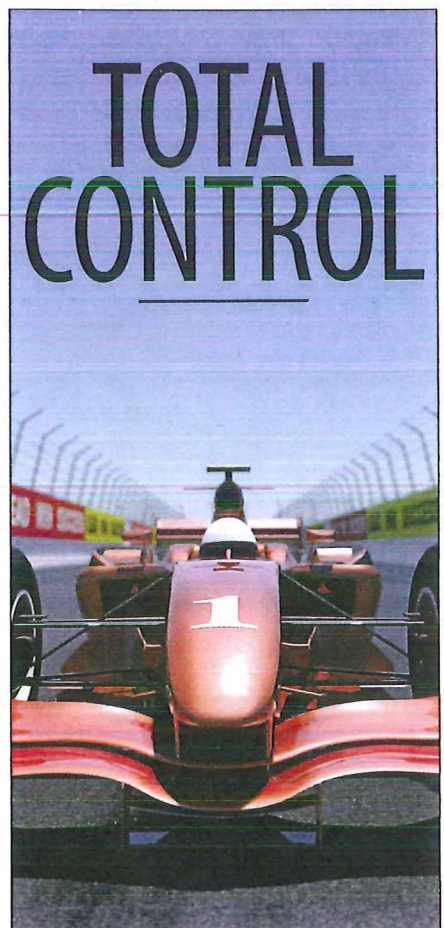
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1 Balmoral SURF products use materials originally developed for Formula 1 racing cars

GEOLOGY & GEOPHYSICS

38 Cutting down to size

As the oil and gas industry reacts to the continued downturn in prices, even the seismic vessels market is taking great pains to trim the fleet and stay competitive. Elaine Maslin surveys the market.

DRILLING & COMPLETIONS

40 Wet tree vs. dry tree criteria

For offshore field development planners, the selection between wet or dry tree completion systems represents a key planning decision. Granherne compares the two and Jeannie Stell captures the details.

EPIC

42 Envy of the (Norse) gods

Heerema Marine Contractor's new semisubmersible crane vessel is set to make waves. Elaine Maslin reports.

44 A soft touch for heavy lifting

Three firms have joined forces to lighten the load of offshore heavy lifting game. Elaine Maslin found out more.

PRODUCTION

46 Seeing the unseeable

Improved ways to gather and interpret geophysical data were highlighted at OTC. Bruce Nichols reports.

PIPELINES

48 CT-ing in the deep

Medical technology has been taken to the bottom of deepwater Gulf of Mexico to help operators understand their flow assurance and asset integrity issues. Elaine Maslin explains a technology first.

GEOGRAPHICAL FOCUS: WEST AFRICA

50 West African risks and rewards

The tides are changing in many countries, which are ramping up their political policies to provide international operators the consistency and transparency needed to invest in the region. Heather Saucier reports.

52 Piracy continues

A change in Nigerian leadership will not end piracy risks to companies that operate oil and gas assets offshore West Africa. AKE Group's Laura Barber weighs in.



Feature Focus

Abandonment and Decommissioning

28 Decom projects on the rise

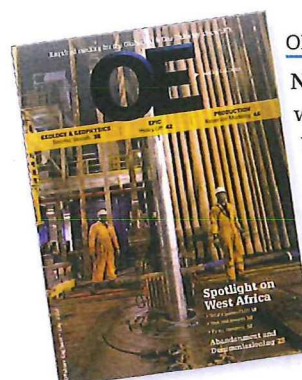
Within the next few years, a couple of major decommissioning projects are set to start in the UK sector of the North Sea at the Brent and Murchison fields — and there are plenty of other projects in the pipeline. John Bradbury outlines the activity.

32 Counting the cost

As decommissioning begins in earnest in the UK North Sea, the real cost of decommissioning is starting to be seen. Elaine Maslin reports on a study conducted to assess the increasing costs.

36 Jack of all trades

Decommissioning, plugging and abandonment, well workovers, EOR, and even offshore renewables maintenance could be performed from the dual decks of the CDC Heron. Elaine Maslin reports.



ON THE COVER

Night moves. OE's July cover features workers on the rig floor of Seadrill's *West Gemini* drillship. The vessel was one of two drillships contracted for Total's CLOV development in Block 17 offshore Angola. See the full story of CLOV's development on page 18. *Photo courtesy of Total/Gonzalez Thierry.*

8 Undercurrents

The North Sea's confidence in the industry is at an all-time low.

"What are the key cost drivers in offshore decommissioning and how can we address them?"

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Our sampling of leaders offers guidance.

12 Thoughtstream

InterMoor's Jim Macklin discusses decommissioning in the 21st century.

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18 Field of View: The golden block

Block 17 has shone brightly for French operator Total and its partners. Now with the fourth development – CLOV – in production, Audrey Leon details how lessons learned and local content proved to be key to Total's success offshore Angola.

23 In-Depth: Realizing CCS's potential

Could the North Sea become a CO₂ storage site? Elaine Maslin takes a look at two proposed projects and some of the challenges involved.

54 Solutions

An overview of offshore products and services.

55 Activity

Company updates from around the industry.

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82 Spotlight: Meet Granherne's Richard D'Souza

Richard D'Souza's career reads like a history of offshore energy development. Jeannie Stell gets his perspective.

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GEOLOGY & GEOPHYSICS

32 Shell's 4D optimizes Brazil waterflood project

Shell's second waterflood monitor survey offshore Brazil shows technical success. Jeannie Stell reports.

DRILLING & COMPLETIONS

36 Integrating MPD into existing rig systems

Revamping older offshore rigs with modern technology positions them for more efficient and safer drilling to target depth. Weatherford's James Onifade and Turkish Petroleum Oilfield Services' Yilmaz Kum and Benhur Sahin explain.

EPIC

38 Designing for tight spaces

Designing a tightly packed, complex turret system is one thing. Designing so it can be built and then maintained without causing hiccups is another. Carlo Pellegrino of Italy's RINA Services sets out the details.

SUBSEA

42 Innovation – in all its forms

Standardization has been high on the agenda at the Underwater Technology Conference (UTC) in Bergen for the past two years. Elaine Maslin reports on innovations discussed and on show.

44 Boosting in the deep

The rewards on offer from subsea boosting technology were spelled out at the MCE Deepwater Development Conference in London this spring by Arne B. Olsen, sales director, pumps and subsea processing at OneSubsea. Meg Chesshyre reports.

PIPELINES

46 Corrosion fatigue behavior of high-strength steel wire

Applying materials and corrosion science to the study of corrosion fatigue in high-strength steel wire aids flexible riser performance understanding. Intertek's Peter Barnes explains.

GEOGRAPHICAL FOCUS: SOUTHEAST ASIA

50 Southeast Asia in focus

Despite the downturn, plenty of development is underway in Southeast Asia. Audrey Raj sets out the detail.

54 Boundary disputes: South China Sea

Offshore assets in the South China Sea are ripe for further development, but territorial challenges are common. Jeannie Stell reports on the conditions affecting Vietnam.

AUTOMATION

56 Understanding the changing workforce

Social collaboration brings context to data and helps find experts. Tom Franklin reports.



Feature

Deepwater intervention

24 Challenges and opportunities: Deepwater Intervention

In advance of 2015 Deepwater Intervention Forum held in Galveston, Texas, Audrey Leon discusses the intervention market in the wake of the downturn, and speaks with several of the forum's board members ahead of the show on 11-13 August.

30 Finding an alternative

Already deployed off Brazil and West Africa, Jerry Lee investigates a new way to intervene on wells — from the drill pipe.



ON THE COVER

Blue skies ahead. This month's cover features the Q5000 from Helix Energy Solutions. The DP3 well intervention vessel will arrive in Galveston, Texas,

the first week of August for final commissioning. This just happens to coincide with *OE's* Deepwater Intervention Forum, also in Galveston. Read more about the forum on page 24. Cover photo and photo on top of page by Neil M. Johnston.

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OE examines Mexico's highly anticipated Round One.

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Douglas Westwood looks at two geopolitical issues affecting the oil price: Greece's possible exit from the Eurozone and the Iran nuclear deal.

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News from the around the world, including discoveries, field starts, and contracts.

18: Field of View: Two for one

Audrey Leon reports on how Anadarko's Lucius field, which went into production in January, came to be.

21: In-Depth: Big data gets even bigger

Elaine Maslin takes a look at other areas, such as condition monitoring, where the industry could make significant gains.

28: Voices

Our sampling of leaders offers guidance.

60: Activity

Elaine Maslin speaks with SPE Offshore Europe co-chair Charles Woodburn ahead of this year's event in Aberdeen, Scotland.

62: Solutions

An overview of offshore products and services.

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66: Spotlight

Eugene Gerden discusses Lukoil's current and future strategy with president Vagit Alekperov.

"What's the greater challenge for deepwater intervention - technology or best practice?"

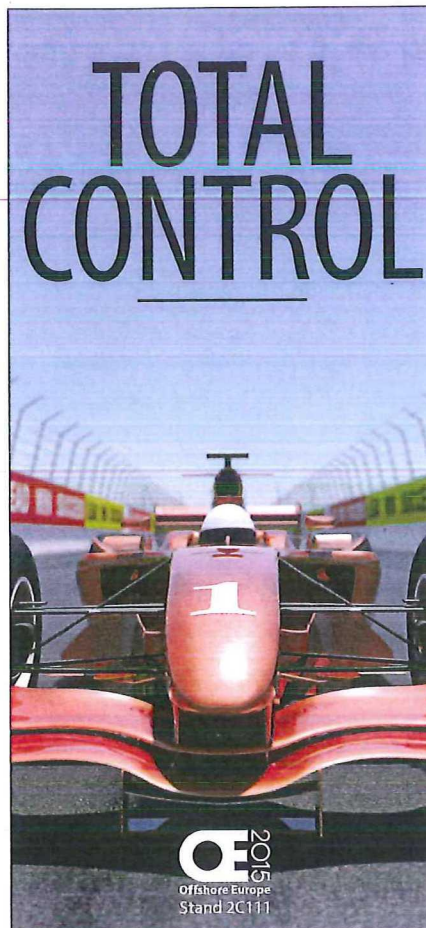


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GEOLOGY & GEOPHYSICS

40 An array of uses

There is more to 4D technology than just exploring for oil and gas. It can also be used to monitor the storage of carbon dioxide and methane in offshore reservoirs in the North Sea. Heather Saucier finds out more.

42 Unlocking potential

A team of subsurface and facilities engineers have been working together to create a viable, small footprint solution for a string of sour fields in the UK's Outer Moray Firth. Mike Cooper explains.

DRILLING & COMPLETIONS

46 Factory drilling

Drilling on Statoil's Mariner will be a mega project – but Statoil is looking to lighten the load in ways that could only be done on such a large project. Elaine Maslin found out more.

50 Designer mud

Designer mud is helping Total tap pressure depleted HPHT reservoirs in the UK North Sea. Elaine Maslin takes a look.

52 Drilling with liner goes deep

Weatherford's Steve Rosenberg and Ming Zo Tan demonstrate how drilling-with-liner technology isolated a depleted sand section in deepwater Gulf of Mexico well in one trip.

EPIC

56 Modeling in the deep

An approach to modeling and simulation combining subsea electrical and fluid systems can facilitate a better understanding of the interaction of long-distance tiebacks supplied by step-outs. ABS' Milton Korn explains.

58 Making it simple

Hurricane Energy has proven commercial oil can flow from its fractured basement oil reservoirs West of Shetland. Its next job is finding an economical solution to get it to market. Elaine Maslin reports.

62 Making waves

Assumptions around tidal arrays need to be rethought, according to Professor Stephen Salter. Emma Gordon reports.

PRODUCTION

64 Systematic evaluation of platform life

Getting to grips with the condition of older assets can be a difficult task. Stefano Copello outlines RINA's approach to revitalization.

68 Carbon sense

Flow visualization in horizontal wells is being improved thanks to carbon composite rods. Elaine Maslin takes a look.



FEATURE FOCUS: FPSO

26 FPS market expected to rise

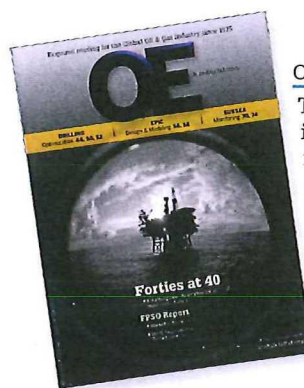
Spending on floating production systems is expected to increase 73% in 2015-2019, with US\$81 billion due to be spent over that period. Douglas Westwood analyst Ben Wilby sets the scene.

30 FPSOs shine bright in down market

In advance of OE's 2015 Global FPSO Forum, in Galveston, Texas, Audrey Leon spoke with the event's co-chairs – SBM Offshore's Jim Wodehouse and Endeavor Management's Bruce Crager – to discuss topics affecting the FPSO sector.

34 A stabilizing design

Audubon Companies' Denis Taylor and LLOG Exploration's Craig Mullett discuss changing design considerations for condensate stabilization on the Delta House FPS in the Gulf of Mexico.



ON THE COVER

Through the looking glass. OE is not the only one celebrating its 40th birthday this year. The iconic Forties field in the UK North Sea, too, began production in 1975. We take a look back on the history of the field and its future. Photo reproduced with permission of BP Archive.

SUBSEA

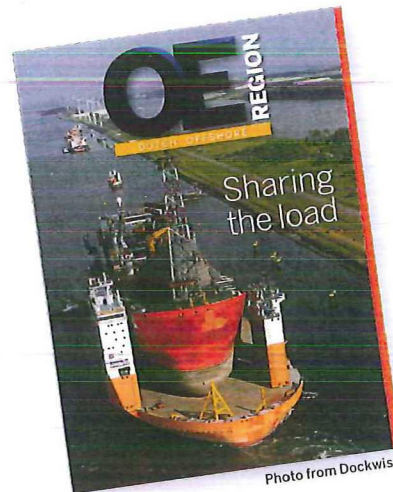
- 70 Life extension or decommissioning?**
Understanding your asset is vital before making the big decision. Clarus Subsea's Vinayak Patil and John MacDonald explain the key challenges of subsea integrity management in the Gulf of Mexico.
- 74 Robotic intervention**
Offshore workers could soon find themselves sharing their facilities with robots, particularly in remote, harsh or hazardous environments. Elaine Maslin looks at the Argos Challenge.
- 76 Overcoming obsolescence**
There is a big risk circling mature production installations where hardware that was once state of the art now poses a problem for managers on late-life assets; that risk is obsolescence. John Bradbury reports.

PIPELINES

- 78 Designs for the future**
Jeannie Stell speaks with classification organizations ABS and DNV GL to discuss today's trends in new pipelay vessels.

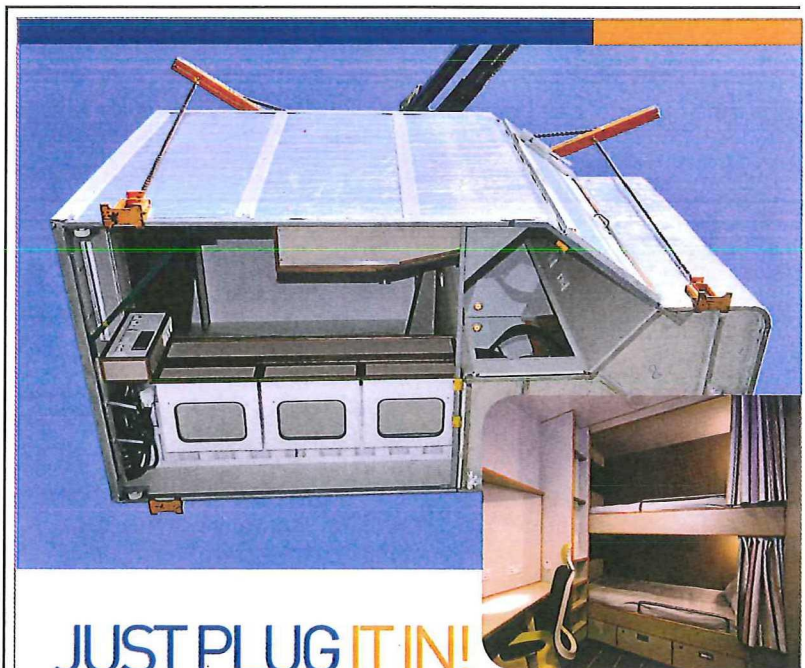
GEOGRAPHICAL FOCUS: NORTHWEST EUROPE

- 82 Challenging times**
Europe is facing a tough downturn, but it will not last forever. Rystad's Audun Martinsen takes a look.
- 84 Current North Sea major projects**
With help from Infield Systems, OE charts the current, ongoing major projects in the market place in Northwest Europe, covering the UK Continental Shelf, offshore Norway, Denmark and the Netherlands.
- 86 Adding EOR to Quad 204**
BP has been making strides in LowSal enhanced oil recovery techniques and Bright Water. It now has its sights set on polymerized water for its Quad 204 development. Elaine Maslin reports.
- 88 Busy work**
Introducing a new FPSO into a brownfield while overhauling the subsea infrastructure led to a complex multi-year SIMOPS campaign for Technip. Elaine Maslin sets out the details.
- 90 Focusing on efficiency**
High oil prices in a mature basin led to a tight market and cost escalation. With low oil prices, the industry is working hard to rein in spending. Elaine Maslin speaks with Oil & Gas UK CEO Deirdre Michie on some of the initiatives underway.



OE Region: Dutch Offshore

Leveraging strength. The cover of OE's special report on the Dutch offshore sector features the *Dockwise Vanguard* carrying its first ever ship-shaped FPSO cargo, the *Armada Intrepid* – one of the largest cargoes ever transported. The *Dockwise Vanguard* successfully delivered the FPSO to Batam, Indonesia, on 8 July 2015, just two months after it set sail from Rotterdam's Caland Canal. OE Regions: Dutch Offshore begins after page 94.



Advantageous approach to the construction of living quarters.
Piikkio Works is the world's leading manufacturer of prefabricated modular cabins. Over the past 30 years the company has delivered more than 130 000 cabins and bathrooms for marine and offshore applications.

www.piikkioworks.fi



SPECIAL: ASSET INTEGRITY

34 Gearing up for asset integrity

Gregory Hale explains how avoidable downtime costs producers billions every year, with equipment failures being the most common culprit.

36 Asset integrity: A bird's eye view

Gregory Hale shows how web-based software utilizes high definition photos and video to extend the life of aging assets.

GEOLOGY & GEOPHYSICS

42 Scientific drilling

A new offshore play is emerging in the oil and gas exploration business – deepwater contourites, Elaine Maslin explains.

DRILLING & COMPLETIONS

44 Drilling automation comes to life

Gregory Hale looks at how automation capabilities are removing guess work and allowing real-time decision-making.

EPIC

46 All subsea options

Most of the building blocks are in place for the all-subsea solution. But do they offer an attractive proposition? Elaine Maslin looks at DNV GL's current thinking.

PRODUCTION

48 Choice of pumps

Jerry Lee investigates the use of hydraulic submersible pumps as an alternative to the common ESP for artificial lift operations.

SUBSEA

50 Sea change

Despite rapid progress in the 80s and 90s, ROV technology development has ground to a halt, according to some. Elaine Maslin reports.

54 Sparking a ROVolution

Subsea robotics firm FMC Technologies Schilling Robotics has a vision, which it thinks could overturn the way subsea equipment is designed.

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58 Neat intervention

Applying university research to an industry challenge has helped create new solutions for Aberdeen's Hydrasun, Elaine Maslin explains.

OFFSHORE EUROPE REVIEW

60 A 2.0 silver lining?

Low oil prices, falling investment and the need to transform the UK exploration and production sector were high on the agenda at SPE Offshore Europe, OE staff reflects.

GEOGRAPHICAL FOCUS: BRAZIL OFFSHORE

64 Revised promises

Brazil will need to drill around 300 development wells in deepwater in order to sustain and reach its production target. Douglas Westwood's Mark Adeosun takes a look at what is at stake.

66 Taking on Papa Terra

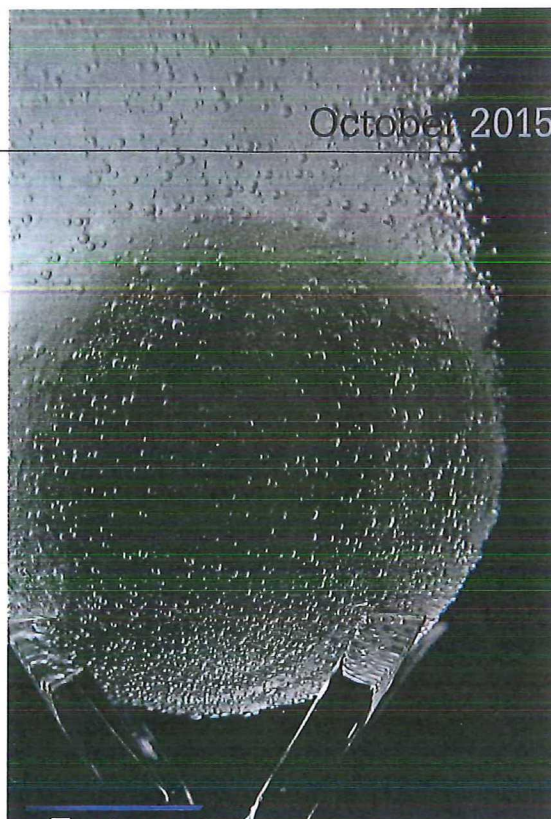
The safe installation of the first tension-leg wellhead platform offshore Brazil could pave the way for future similar developments, says DNV GL's Mike Roberts and David Ryan.

68 Tackling the deep

Brazil's deepwater offers huge opportunities, but also big technology challenges. The Industry Technology Facilitator's Paddy O'Brien and Arthur Braqa explain.

70 What's in the car wash?

Robert Gordon University's William Craig discusses the federal corruption investigation Operation Car Wash and its effects on Brazil's oil and gas sector.



Feature

Nanotechnology

28 Nanotechnology: an industry perspective

Audrey Leon spoke to Rustom Mody, Vice President and Chief Engineer, Baker Hughes Enterprise Technology, to learn more about the company's research and development of nanotechnologies. Plus, experts from 3M and Tenaris share their thoughts.

30 Living in a material world

Nanotechnology is a wide and growing field being researched and developed by both academia and industry alike. Elia Barnett spoke with researchers at University of Houston, Rice University, and service company Halliburton to see how far the technology has come.



ON THE COVER

Hustle & bustle. This month's *OE* highlight's Brazil Offshore sector. InterMoor supplied 15 conductors for the Papa Terra project in 2012, examined on page 66. The cover photo, provided by InterMoor, shows well conductors for Papa Terra being loaded on a barge for installation at the Port of Rio de Janeiro.

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OE champions Communication2.0.

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Halliburton's Abdalla Awara says innovation is the key to unlocking Brazil's deepwater reserves.

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20 Field of view: Bringing Perla online

Shreeram Lom, Aaron Rampersad, and Juan Martínez, of Repsol, discuss the Perla development, which came online offshore Venezuela in July.

26 In-Depth: Supply and demand

When the oil price drops, people want to know how long the decline will last and when it will go back to "normal." Audrey Leon reports on how market watchers and researchers tried to make sense of the downturn at this year's SPE Offshore Europe.

"Are you using nanotechnology in your operations?"

29 Voices

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An overview of offshore products and services.

74 Activity

Company updates from around the industry.

76 Spotlight: Tyler Schilling

Another firm marking a milestone anniversary this year, like OE, is Schilling Robotics – now FMC Technologies Schilling Robotics. Elaine Maslin profiles co-founder Tyler Schilling.

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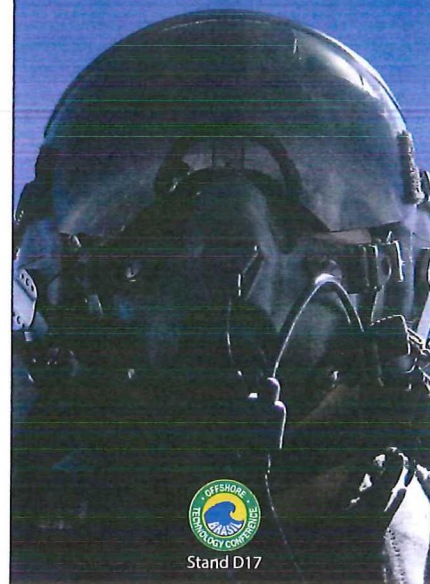
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Industry facts and figures

82 Asset of the Month

Varel produced what it believes to be the largest drill bit in the world – it was nicknamed Monster by the drilling engineer who used it on its first outing this year, Elaine Maslin reports.

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GEOLOGY & GEOPHYSICS

32 Investigating the deep

Heather Saucier speaks with Mark Randolph and Susan Gourvenec, professors at the University of Western Australia's Centre for Offshore Foundation Systems about deepwater geotechnical challenges, such as complex carbonates found off the coast of Australia, and new developments for effectively exploiting deepwater oil and gas.

DRILLING & COMPLETIONS

36 Visualizing downhole data

Melanie Luthi, Sanna Zainqune, and Stephen Forrester, of NOV, discuss how streaming downhole data on a job in the Norwegian North Sea helped improve both the drilling process and decision making.

EPIC

38 Minimal facilities for maximum margins

As the oil price continues to fall, more focus is falling on lower cost platform solutions for marginal fields. John Bradbury reports on a marginal field development consortium project.

PRODUCTION

42 Tablet-based software for Ex inspections and maintenance

René Larsen, of Inspection and maintenance software specialists SafeEx, discusses how Ex inspection software was deployed on a gas compression jackup rig destined for the Cantarell field offshore Mexico.

SUBSEA

44 The future of flow

NEL's Emmelyn Graham discusses multiphase flow measurement – where is it going and what is needed.

46 Going deep, but still some way to go

ROV technology developers gave an update on their progress at the Subsea UK ROV Conference. Elaine Maslin reports on some progress, as well as where one operator thinks ROV and AUV technology could improve.

49 Eye on the industry

OE spoke with Scott McIntyre, Project Manager, Technip UK, to find out his thoughts on the oil and gas business and his advice for young professionals.

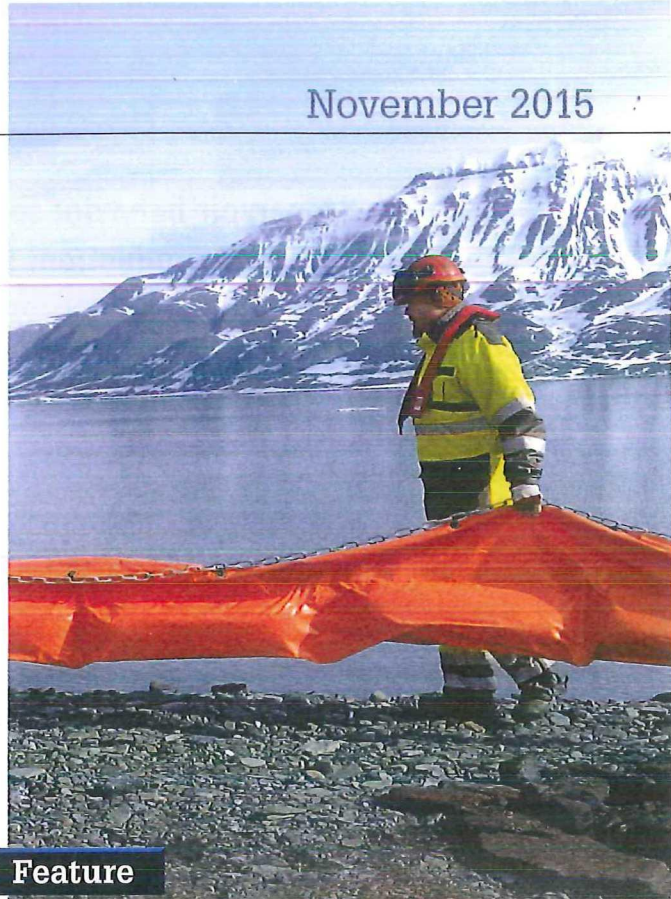
MEDITERRANEAN & NORTH AFRICA

50 Mediterranean gridlock

The Mediterranean and North African region is largely considered to be a promising frontier oil and gas area, and yet, border tensions, and internal disputes have seriously held back exploration efforts. Audrey Leon surveys the prospects.

54 Surveying Mediterranean prospects

Jerry Lee reports on all the exploration and production activity currently ongoing in the Mediterranean and North Africa.



Feature

HSEQ

26 Lessons learned

Learning from incidents is easier said than done. Edward Smith and Richard Roels, of DNV GL, give guidance on how to maximize learning from incidents, accidents and other events.

28 Taking augmented reality subsea

Mark Stevens and Bob Moschetta, of Oceaneering, discuss the benefits of using augmented reality for subsea training.



ON THE COVER

A whole new reality.

Companies such as Oceaneering International, are using next-generation training techniques to get their employees ready before they get into the field and have to deal with real life equipment and

situations. Find out more in our cover story on page 28. Image rendered by Luís Parada Pereira from Abyssal, courtesy of Oceaneering International, Inc.

Can cost efficiency and safety be complementary?

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Our sampling of leaders offers guidance.

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OE Staff muses on how Israel can sweeten the deal to attract foreign oil and gas investors.

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18 Field of View: Malampaya fuels the Philippines

Audrey Raj explains how an old deepwater field such as Malampaya continues to power the Philippines and benefit its economy.

21 In-Depth: Thinning the herd

For the offshore floating rig market, the downturn presented the perfect storm: too many rigs, not enough demand, and with some 200 newbuilds set to enter the market over the next decade. Audrey Leon reports.

59 Automation: Understanding pore pressure

Gregory Hale discusses how managed pressure drilling helps to eliminate the guess work.

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62 Spotlight: A treasure TROV

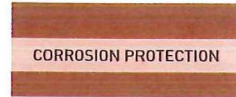
Jim McFarlane introduced ROVs to the North Sea industry in the 1970s and went on to pioneer AUV development. Elaine Maslin learned more from the still active industry veteran.

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66 Asset of the Month: Fit at 30!

It was the first floating production unit in the North Sea and it's still going strong – with a deployment to its latest field, on its 12th contract, due to start next year. Elaine Maslin looks at Teekay Offshore's *Petrojarl I*.



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Despite the massive cut backs the industry is facing, including cuts to exploration programs, drill bits continued to spin in 2015. Elaine Maslin reports.

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When *OE* turned 10 in 1985, we invited the leading figures in the offshore industry to reflect on highlights from the previous decade. Now that we're older and wiser, we decided to yet again reach out to some familiar and not so familiar faces to not only reflect on the past, but to ponder the challenges yet to come.

56 **Hard at work**

OE asked readers to send in their offshore photos, and send they did!

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40
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Feature

HPHT

28 **Raising the bar**

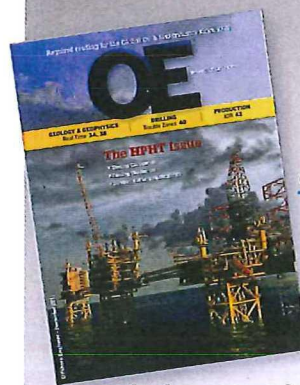
Getting HPHT right is a real challenge for today's industry, involving finding new materials, setting new standards and building competence in the industry. Elaine Maslin reports.

30 **Deeper, hotter umbilicals**

Materials technology is being challenged to its limits in the deepwater and high-temperature applications the oil industry is heading into. Technip's Alan Rutherford outlines work to make umbilicals fit for purpose in this area.

33 **Why the UKCS must make the most of HPHT development**

Maersk Oil UK's managing director Morten Kelstrup discusses HPHT development potential in the UK Continental Shelf.



ON THE COVER

Turning up the heat. Despite being a mature province, the North Sea continues to reap rewards for those willing to go into new plays and expand the limits of technology. Maersk Oil's

high-pressure, high-temperature Culzean field, a Maersk Oil artist's visualization of which adorns our cover, is an example. Read more on page 18. *Photo courtesy of Maersk Oil.*

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What do you think will be the biggest breakthroughs next 1-2 years?

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Mastering HPHT reservoirs has been a UK North Sea challenge for more than a decade. Elaine Maslin reports on how Maersk Oil is taking lessons learned by others and applying them to the Culzean field.

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We're in tough times, but that also means there's an opportunity to seek new solutions, according to Proserv's David Lamont. Elaine Maslin went to hear the CEO's views.

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66 Asset of the Month: Bells and whistles

Odfjell Drilling's Deepsea Aberdeen has all the bells and whistles for working west of Shetland. Elaine Maslin takes a look.