

## CALL FOR ABSTRACTS

SPE WORKSHOP  
IN ARCTIC NORWAY  
HARSTAD 11 - 12 MARCH 2015

Reservoir Drainage Strategy  
and Reservoir Management

•  
Drilling & Well,  
Subsea and Hardware



# The First

*SPE Oslo magazine*

## Special Topic

Experiencing geology from different  
perspectives:  
from Costa Rica to Norway

Big Data  
Solutions & Analytics in  
Oil and Gas Industry

Conference and Exhibition  
February 10, 2015

Registration is open!  
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## The First—the SPE Oslo section Magazine

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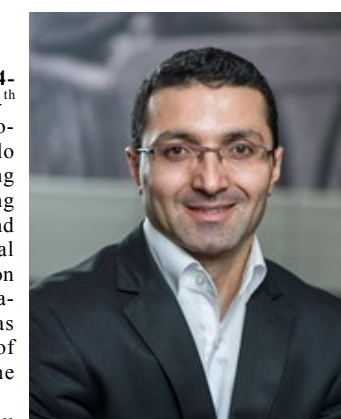
## Chairman's Message

Dear Colleagues and Friends, Season 2014-2015 has been very exciting and packed for Society of Petroleum Engineers (SPE) Oslo section so far. We had a great meeting with Norwegian Patent Registration Office on October 15<sup>th</sup>. The meeting was very informative and provided a very good insight on patent registration process and on protecting intellectual property. The officers in Patent Registration Office were also very kind to provide detailed and in-depth knowledge to the individuals with specific questions through small group discussions. The presentation materials can be available to the members through SPE Oslo contacts.

SPE Oslo Young Professionals season 2014-2015 was officially kicked-off on October 16<sup>th</sup> in Solli Scandic Hotel. This season SPE Oslo Young Professional Kick-off was in partnership with DNV GL and Kongsberg Oil & Gas Technologies. The event included three technical and very interesting presentations from Aker Solution, DNV GL, and Kongsberg Oil & Gas Technologies. The kick-off event was very well received with 70 young professional participants.

The first lecture of “**SPE Distin-**

**guished Lecturer Series 2014-2015**” was held on November 4<sup>th</sup> in a lunch meeting at AGR Petroleum Services’ office. SPE Oslo had the pleasure of inviting Mohsen Achour who is leading the “Corrosion, Inspection and Materials” group within “Global Production Excellence” division of ConocoPhillips in Tulsa, Oklahoma. The title of the lecture was “The Science and Engineering of Internal Corrosion Control in the Upstream Petroleum Industry”. I would also like to inform you that SPE Oslo was in partnership with FORCE is organizing a workshop on “**Microbial Enhanced Oil Recovery (MEOR): From Theory to Field Implementation**” on November 18<sup>th</sup>, 2014 in Stavanger, Norway. The workshop also covered “Tracer Technology” to monitor and optimize Enhanced Oil Recovery (EOR) processes. FORCE is a co-operating forum for Improved Oil and Gas Recovery (IOGR) and Improved Exploration (IE) conducted by oil and gas companies and authorities in Norway. Through the partnership with SPE Oslo and FORCE, SPE Oslo members could sign up for this upcoming MEOR workshop at FORCE member fee. Finally, I would like to invite you



**Jafar Fathi**  
*SPE Oslo Chairman*  
2014-2016

to join us in the upcoming traditional **Christmas Technical Dinner** to be held on December 2<sup>nd</sup> in Hotel Continental. The evening will start with a technical presentation followed by a lovely dinner.

Looking forwards to seeing you,

*Jafar Fathi*  
*SPE Oslo Chairman*  
2014-2016



## Events report...

### The SPE Oslo kickoff season 2014-2015 event

16th September 2014



*Ekeberg Restaurant*

The SPE Oslo season 2014-2015 was officially **kicked-off** on September 16<sup>th</sup> at the famous Ekeberg Restaurant in Oslo. A record breaking 85 members and non-members were welcomed with an aperitif on the balcony overlooking Oslo city. The event has historically been held at "Dyna Fyr" but due to a growing member base as well as a high turn-out the event was held at the Ekeberg Restaurant for the first time.

The invited speaker was Knut Åm, and the topic was "IOR/EOR for the future". Mr. Åm is a well know expert in geophysics and a longstanding CEO of Phillips Petroleum Company Norway. Mr. Åm has an impressive resume among others being the first Norwegian manager for Ekofisk, the first Norwegian CEO of Phillips Petroleum Norway and a former winner of the SPE "Oilman of the Year" (1994). Most people know Åm as the head of the so-called "Åm-utvalget", which in 2010 published a report on "IOR on the Norwegian continental shelf." on behalf of the Norwegian Ministry of Oil and Energy. During his presentation Mr. Åm touched upon the conclusions from the Åm-report and what had been done in the industry and the government since the report was published. He discussed specific IOR/EOR technologies and what is needed to obtain a sustained and long term petroleum production. It was a well-received talk and the session finished with a great deal of questions from the enthusiastic audience.

The discussions continued around the tables with a nice 3 course menu and as always in true SPE tradition, coffee and avec. The SPE Oslo board is very pleased with the turn out, the presentation and the restaurant, and is looking forward to another exiting season with the members of SPE Oslo.



### Lunch meeting with the Norwegian Industrial Property Office

15th October 2014

On October 15<sup>th</sup> Norwegian Industrial Property Office (Patentstyret) invited our members to their offices at Sandakerveien in Oslo for a Lunch meeting on "Intellectual Property rights and patenting". Norwegian Industrial Property Office is a government authority under the Ministry of Trade, Industry and Fisheries and their primary role is to promote innovation and value creation, both

as national intellectual property rights authority and as a guide and knowledge provider. NIPO contributes to competitiveness and helps to strengthen Norwegian trade and industry in various ways. NIPO was well prepared with a presentation that focused on patenting relating to the oil and marine industry. NIPO talked about the basics of a patent, patent requirements and the

patenting process. SPE Oslo is very pleased that NIPO had as many as 15 of their employees attending the meeting and with 20 members participating it was very easy to interact and ask questions during and after the meeting.

For the members that were not able to attend we have made the presentation available on the website.



*Norwegian Industrial Property Office*

### Great Season Kick-off at the Fall Oslo YP event

15th October 2014

The Fall 2014 SPE Oslo YP kicked off to a great start with three industry presentations with a full audience by oil & gas young professionals on 16 October 2014. The event was hosted at the Solli Scandic Hotel in Oslo. In addition to the regular sponsors, the Oslo SPE YP section also received a sponsorship from DNV GL, Kongsberg O&G and from bmi regional. The three speakers from the industry were, Artem Lytkin, VP Technology-Strategy, Aker Solutions; Dr Gullik Jensen, Global Product Manager Kongsberg Oil and Gas Technologies; and Carl

Sixtensson, Senior Consultant Renewables, DNV GL. The event also hosted two stands from DNV GL and Aquateam COWI AS. Artem gave a talk on the Subsea leveraging technology innovation to mitigate operational risks. He gave an overview of the subsea technology and spoke about how technology innovation will be instrumental in mitigate the risks. Dr Jensen spoke about drilling riser monitoring for improved offshore drilling operations, where he gave an overview of the drilling offshore and about risers. The presenta-

tion was supplemented with real videos from offshore to give a good perspective to the young audience. In the last talk, Carl spoke about integration of offshore wind for oil and gas. Carl explained a novel concept of harnessing offshore wind power to platforms and for oil and gas extraction.

The event also had a lottery, which entitled for two return tickets from Oslo to Aberdeen sponsored by bmi. The lucky draw was announced by the SPE Char Jafar Fathi and the ticket was won by Shiva Talatori, PhD, specialist AkerSolutions. SPE Oslo YP would also like to thank Nina Handegaard Business Development who gave us tickets and congratulate the lucky winner. The event had live music, networking, tapas and mingling. SPE YP would like to thank all the sponsors for this event who made this event possible. Last but not the least, this event would not have taken place without the SPE YP Chair, Vita Kalashnikova for all her zeal and enthusiasm to make this reality come true.



*Music band "Four on the Floor"/ Scandic Holet*



*Stands from Aquateam COWI AS, SPE Oslo Secretary Ashish Sahu and Michael S Nilan, MSc. Environmental Technology, Consultant*





(a) Artem Lytkin, VP Technology-Strategy, Aker Solutions; (b) Dr Gullik Jensen, Global Product Manager Kongsberg Oil and Gas Technologies; (c) Carl Sixtensson, Senior Consultant Renewables, DNV GL; (d) SPE Oslo Secretary Ashish Sahu handing bim tickets to Shiva Talatori, PhD, specialist AkerSolutions; (e) stands of DNV GL, SPE YP Chair Vita Kalashnikova and Dmitry Sukhinin, Regional Sales Manager, Sales and Support Nordic & East Europe DNV GL - Software - Russia and CIS



## Lunch meeting - Distinguished Lecturer: The Science and Engineering of Internal Corrosion

4th November 2014

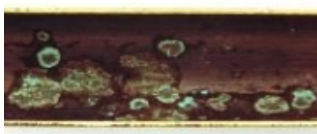


**Mohsen Achour**  
Adjunct Professor at Ohio  
University

Mr. Mohsen Achour from ConocoPhillips presented on November 4th: "The Science and Engineering of Internal Corrosion Control in the Upstream Petroleum Industry". Mohsen Achour is currently leading the Corrosion, Inspection and Materials group within Global Production Excellence division of ConocoPhillips. Mohsen holds a PhD in Chemical Engineering and Materials from Oklahoma State University (USA) and Adjunct Professor honorary position from Ohio University Institute of Corrosion and Multiphase Technology. He

held an Associate Professor of Chemical/Process Engineering position at the University of Carthage in Tunisia for 11 years before joining ConocoPhillips. He has published more than 70 papers and patents in transport phenomena and corrosion and supervised more than 20 MS and PhD students. He is a member of SPE and NACE International and has been extensively active chairing multiple technical com-

mittees, sessions and symposiums in regional and international conferences for both organizations. The full article "The Science and Engineering of Internal Corrosion Control in the Upstream Petroleum Industry" you can read in the next issue of "The First".



The conference will address the challenges and opportunities associated with big data within an exploration and production domain and how to employ big data for better decisions and competitive business advantages.

### Conference sections:

- Big Data Analytics Status in E&P and Drilling
- Established and Emerging Big Data Technologies
- Data Management Solutions in E&P
- Big Data Analytics and E&P

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**Registration  
is open!**  
[www.bigdataspeoslo.com](http://www.bigdataspeoslo.com)

### Registration Dates

Early Registration Ends Sunday, November 30, 2014  
Regular Registration Ends Thursday, January 15, 2015  
Late Registration Ends Thursday, February 5, 2015

**Conference venue:**  
**Radisson Blu Scandinavia Hotel**  
Holbergs gate 30  
Oslo 0166

**Conference Dinner:**  
**Sjømagasinet Restaurant**  
at 19:00  
Tjuvholmen Allé 14 / 0252 Oslo

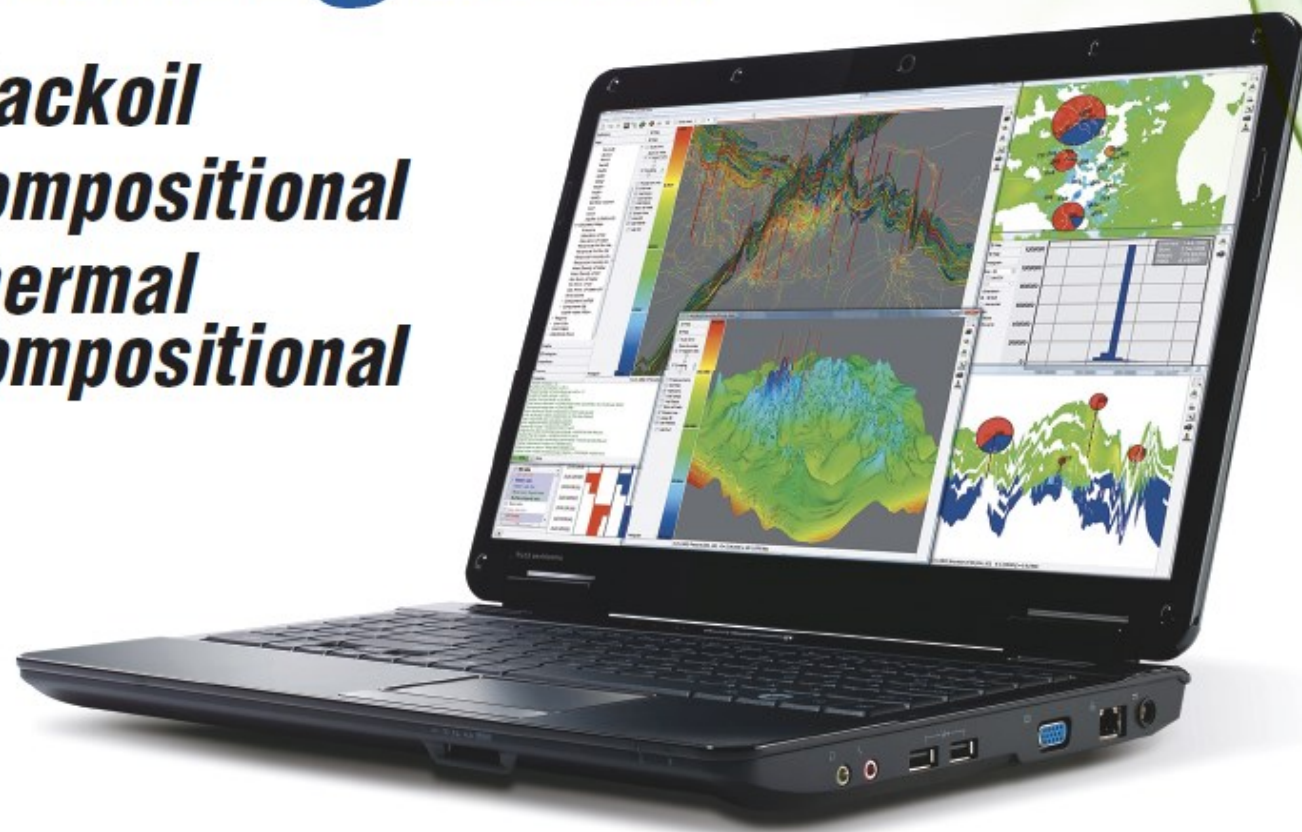
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## SPE Christmas Dinner 2015!

December 2, 2015 5:30 PM

Dear friends and colleagues, time has come to gather for our traditional Christmas Dinner Meeting! So let's meet friends and colleagues in the industry and enjoy a good Pinnekjøtt dinner. We are pleased to invite you all to the Hotel Continental Tuesday December 2nd at 17:30! This year, we have the pleasure to offer you two presentations! The first one will be on Evaluation of Polymer and WAG on Johan Sverdrup using a new generation simulator, and will be presented by Geir Magnus Sæternes and Jens-Petter Nørgård from Lundin Petroleum and Dmitry Eydinov from RFDY (tNavigator). The second presentation will be from Håvard Morset Klock from DNO International about their lessons and experiences in their middle east operation and especially in Kurdistan. We are looking forward to see you all!

### Evaluating Polymer and WAG on Johan Sverdrup Using New Generation Simulator

Geir Magnus Sæternes, Lundin Petroleum; Jens-Petter Nørgård, Lundin Petroleum; Dmitry Eydinov, RFDY (tNavigator)

Lundin as operator of the PL501 license has put significant effort into understanding the sub-surface of the large Johan Sverdrup field. One topic that is given attention is IOR. Polymer flooding is considered one method that may have potential on this field. Lundin initiated an R&D project with Tiorco of Denver to study polymers for Johan Sverdrup and other reservoirs. Several core flooding experiments were performed and the polymer characteristics recorded. To quantify the effect and economical impact of polymer flooding Lundin wanted to apply the characteristics of the best polymers in a dynamic simulation. Simulation time was soon identified to be a major challenge, especially when combined with water alternating gas (WAG) injection. This talk will describe the solution; a new generation simulator, and how this was implemented into the workflow.

Over the last few years, the hardware architecture has changed significantly. Every desktop or now. One of the key challenges for reservoir simulation software is to be aligned with the heaven a laptop is a multicore supercomputer hardware evolution, and deliver performance results proportionate to the growth of the computational power available on the hardware market. The most recent studies of modern parallel computation methods show that the model simulation time can be reduced almost boundlessly as the number of CPU grows. In this talk, we will give an overview of the modern hardware trends and discuss some practical aspects that help to maximize the hardware performance in the reservoir simulation applications.

### DNO International Lessons and Experiences: Kurdish Delight

Håvard Morset Klock, Development Manager, Kurdistan Sub-surface

The presentation will give a brief overview of the DNO portfolio, with main emphasis on the Kurdistan assets. DNO operated production in Kurdistan will soon reach 200,000 bopd, and with 9 more reservoirs in early development phase there is still potential to increase further. This will show the key steps on how we aim to do just that. DNO is a Norwegian exploration and production company focused on the Middle East and North Africa. The company holds stakes in oil and gas blocks in various stages of exploration, development and production, both onshore and offshore, in the Kurdistan region of Iraq, Yemen, Oman, the United Arab Emirates, Tunisia and Somaliland.

Speakers bio:

**Geir Magnus Sæternes** graduated from Norwegian University of Technology and Science (NTNU) in 2009, and started the graduate programme in Statoil. He worked three years in operated assets Tyrihans and Kristin with various reservoir simulation and modeling tasks. In October 2012, Geir Magnus started working in Lundin as senior reservoir engineer. He is following Lundin non-op assets in Alvheim area, and also a company representative offshore during well testing of exploration wells.

**Jens-Petter Nørgård** graduated from Norwegian University of Technology and Science in 1998 with a Master in Petroleum Technology. He started his career with PGS Reservoir where he also wrote his Master thesis. After this he held various positions with Enitel, Petrel, Schlumberger and SPT Group. He was 5

years with DNO managing the petek and sub-surface activities on their Kurdistan assets and in particular the Tawke field. Since 2012 he has been with Lundin as sub-surface lead for Johan Sverdrup and currently Johan Sverdrup Future Phase Lead within Lundin.

**Dmitry Eydinov** holds the position of Business Development Director in Rock Flow Dynamics – a software company developing reservoir simulator tNavigator. He completed MSc in Applied Mathematics and Physics in Moscow Institute of Physics and Technology in Russia. He holds PhD in Applied Mathematics and Computer Science from The University of Bergen in Norway. After graduation he was working several years for SPT Group as the MEPO representative in Russia&CIS. Dmitry has wide experience in software develop-

ment. The range of applications includes dynamic reservoir modelling, uncertainty quantification and assisted history matching.

**Håvard Morset Klock** holds a MSc in Reservoir Engineering from NTNU, and started his career in A/S Norske Shell in 2006. There he worked as reservoir engineer working in the production optimization team on the Draugen oil field, and later in field development on the Ormen Lange gas field. In 2011 he joined DNO ASA as senior reservoir engineer focusing on the Tawke field development. From 2012 he was the reservoir engineering lead for the Kurdistan business unit, and in 2013 he was appointed subsurface development manager for all Kurdistan assets. He is currently also the project manager for the Benenan Najmeh heavy oil development.





# SPE Northern Norway

by Marius Stamnes, Communications Chair and Student Liaison, SPE Northern Norway Section/Lead Completion Engineer, Weatherford Norge AS

## The Call for Abstracts for the 2015 SPE Workshop in Arctic Norway is Now Open



*Marius Stamnes  
Communications Chair  
and Student Liaison,  
SPE Northern Norway  
Section/Lead Completion  
Engineer, Weatherford  
Norge AS*



### CALL FOR ABSTRACTS

SPE WORKSHOP  
IN ARCTIC NORWAY  
HARSTAD 11 - 12 MARCH 2015

Reservoir Drainage Strategy  
and Reservoir Management

•

Drilling & Well,  
Subsea and Hardware



Northern Norway Section



The SPE Northern Norway Section held the first annual SPE Workshop in Arctic Norway 20-21 March 2013. Our aim is to make this the best technical conference for discussing challenges in the Norwegian Arctic Shelf - the Northern part of the Norwegian Sea and the Barents Sea. In 2014, 95 delegates from the industry and universities, and 100 students attended the event at Harstad Kulturhus, which was opened by State Secretary Kåre Fostervold from the Ministry of Petroleum and Energy.

**11-12 March 2015** the third SPE Workshop in Arctic Norway will be held in **Harstad Kulturhus**. The Workshop will focus on technical and operational challenges in a cost effective perspective for the arctic region including:

**Reservoir Drainage Strategy and Reservoir Management**

- Maximizing recovery through optimal drainage strategy
- Reservoir monitoring
- Fractured and tight reservoirs
- Shallow reservoirs – flow as-

surance and injection challenges  
• Gas export solutions

**Drilling & Well, Subsea and Hardware**

- Innovative solutions for cost efficient field developments in immature areas / rural environment
- Drilling challenges in northern areas
- Inclined wells in shallow reservoirs
- Relief wells – requirements and constraints
- HSE restrictions for produced water, slop and cuttings handling

We invite you to submit your presentation proposal by sending a short abstract (1/2 page), by 1 December 2014 to [harstad@spe.no](mailto:harstad@spe.no).

Read more at <http://www.speworkshop.no> and see the videos from the previous events at <http://www.youtube.com/SPENorthernNorway>

**Follow the SPE Northern Norway Section at:**

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YouTube: <http://www.youtube.com/SPENorthernNorway>

**Harstad/Narvik SPE Student Chapter Kick Off**

During the 2013/2014 season, our section spent much time informing the engineering students in the Harstad/Narvik region about SPE. The students were invited to our DL events, social events and the parallel student session at the 2014 SPE Workshop in Arctic Norway. During this time we also introduced them to the idea of forming a joint student chapter between the two University Colleges in Harstad and Narvik. SPE International officially accepted the Harstad University College/Narvik University College SPE Student Chapter 27 May.

The idea behind the joint student chapter is to link the students at these two university colleges with each other at an early stage, as well as linking them with our industry. Bus transport between Narvik and Harstad will be arranged for our section events and between Harstad and Narvik for the student events.

3 November the students held their successful kick off at Narvik University College with presentations by Narvik University College, SPE Northern Norway, Statoil, Total E&P and Quinterra with an attendance of 25 students from Harstad and 75 students from Narvik.

We congratulate the students with their brand new Student Chapter!

Follow the student chapter at: <https://www.facebook.com/spe.studentthn>



Marius Stamnes, SPE Northern Norway, Børge Andreassen Vice President SPE Harstad/Narvik Student Chapter and Kim Kristoffersen, President SPE Harstad/Narvik Student Chapter. Photo by Lone Martinsen, Fremover

## Event Calendar 2015 SPE Northern Norway

Date	Time	Event	Location
Dec 04 2014	07:30	Young Energy Breakfast at Weatherford. Partners: the Norwegian Petroleum Society and the Norwegian Oil and Gas Association	Weatherford Harstad
January 2015	TBA	2015 SPE Northern Norway Tapas & Wine Event	TBA
Feb 12, 2015	19:30	Distinguished Lecturer Curtis G. Blount, ConocoPhillips Lessons Learned in Technology Development...and Perforating 'Smart'Wells	Thon Hotel Harstad
March 11-12, 2015	09:00	2015 SPE Workshop in Arctic Norway	Harstad Kulturhus
May 18, 2015	19:30	Distinguished Lecturer Klaus Potsch, Formerly OMV E&P Understanding and Checking the Validity of PVT-reports	Thon Hotel Harstad



# Subsea - leveraging technology innovation to mitigate operational risks

by Artem Lytkin, VP Technology Strategy, Aker Solutions



Artem Lytkin

Vice President

Technology Strategy,

Aker Solutions

### Energy Demand

The World Energy Outlook (WEO) report forecasts oil demand to increase by 16 per cent between 2012 and 2035, from 87.4 million barrels per day in 2012 to 101.4 Mbb/d in 2035. According to the report, the share of oil in the primary energy mix is expected to continue to be the largest single component, and the growth will be mainly driven by expected increase in demand in China, India and the Middle East. Natural gas demand is expected to increase by 48 per cent between 2011 and 2035, with the growth in demand for natural gas expected to exceed that of any other individual fuel. The report forecasts the share of natural gas in the primary energy mix to increase from 21 per cent to 24 per cent between 2011 and 2035, with the largest absolute increases in demand expected to be in China, the Middle East and North America.

### Oil and Gas Supply

Oil supply is projected to reach 101 Mbb/d in 2035, an increase of 12 Mbb/d from 2012 levels. Key components of the increase are expected to be unconventional oil (expected increase of 10 Mbb/d over the period) and natural gas liquids (“NGLs”) accompanying the increase in global gas output (expected increase of 5 Mbb/d over the period). Unconventional oil and NGLs are expected to fill the gap between increasing global demand and conventional crude oil production. Conventional crude oil production’s share of oil production is expected to decrease from 80 per cent in 2012 to 66 per cent in 2035, despite a forecast increase in offshore deepwater conventional crude oil production.

The report forecasts an increase in natural gas production between 2011 and 2035 in every region except Europe, where robust production from Norway is not expected to be sufficient to offset the expected decline in production of maturing fields in other parts of the North Sea and onshore Netherlands. Conventional gas as a whole is expected to contribute 52 per cent of the increase in production, with the

rest expected to come from unconventional sources.

### Oil and Gas Prices

According to the WEO, the price of Brent crude oil has averaged more than USD 110 per barrel since 2011, a sustained period of high oil prices that is without parallel in oil market history. It is expected that high oil prices will persist, with the average oil price forecast to reach USD 113 per barrel in 2020 and USD 128 per barrel in 2035.

Although international trade in natural gas continues to expand rapidly, there is no single global pricing benchmark for natural gas as there is for oil. Rather, there are three major regional markets; North America, Asia-Pacific and Europe, with prices established by different mechanisms. Large geographical spreads in natural gas prices are expected to persist during the outlook period, albeit with a degree of convergence brought about by increasing LNG supplies, increasing short-term trading and greater operational flexibility. The 2013 WEO report forecasts that gas prices in 2035 will reach USD 6.8 per million Btu in North America, USD 12.7 in Europe and USD 14.9 in Asia-Pacific. Natural gas prices in Japan are forecasted to be more than double those in the United States in 2035, meaning that the spread is expected to be much narrower than observed recently, but much greater than before U.S. production of shale gas began increasing in the last decade.

### E&P Spending Outlook

According to Barclays Equity Research Survey, based on spending plans of more than 300 oil and gas companies, 2014 global E&P spending is forecasted to grow by approximately 6 per cent to a record high of USD 712 billion. This would represent the fifth consecutive year of annual worldwide spending gains since the 2009 economic downturn. The strongest gains are expected to come from North America and the Eastern Hemisphere. Spending for European E&P companies is expected to be slightly

lower in 2014 compared to prior expectations in December 2013. This is largely due to lower expectations in capital expenditures growth for BG, EnQuest, and Statoil. Barclays Equity Research forecasts that European E&P companies will be challenged to increase production while lowering spending, and instead expect these companies to focus on technological improvements and technological/operational or organisational efficiency measures in the coming years, in order to maximise returns from expenditures. This capital discipline is driven by a short-term focus on cash returns due to equity market pressure, and Barclays estimates investor focus and preference will ultimately shift back to production growth (from cash flow growth).

### Offshore Focus

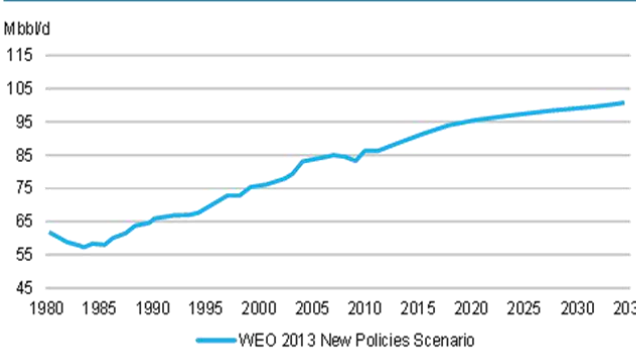
In 2013 approximately 30 per cent of global oil supply was produced offshore. Offshore production is expected to continue to increase as ongoing depletion of major conventional onshore fields continues, and developing subsea processing technology helps drive investment into deepwater production, hence attracting a growing share of E&P capital expenditure.

According to Rystad Energy, total offshore capital expenditure is estimated to increase from USD 221 billion in 2013 to USD 330 billion in 2019, representing a compound annual growth rate (CAGR) of 7 per cent.

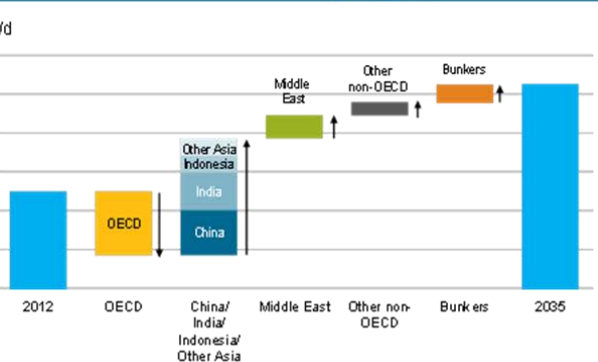
Furthermore, approximately 52 per cent of total offshore capital expenditure during 2014 to 2018 is expected to target deepwater (water depth between 125 and 1,500 metres) or ultra-deepwater (water depth greater than 1,500 metres) projects. In addition to the established deepwater regions in Brazil, West Africa and the U.S. Gulf of Mexico, the newly discovered offshore gas provinces in East Africa and the Eastern Mediterranean are also located at water depths greater than 1,000 metres.

Africa and South America are the regions expected to show the strongest growth in offshore capital

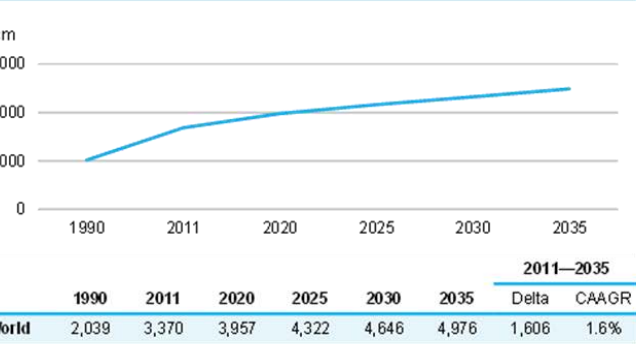
### World Oil Demand



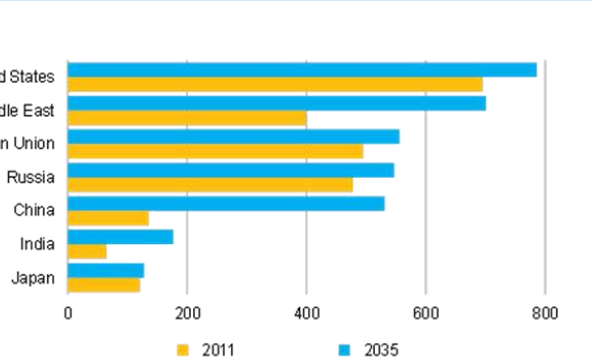
### Growth in World Oil Demand by Region, 2012–2035



### World Natural Gas Demand

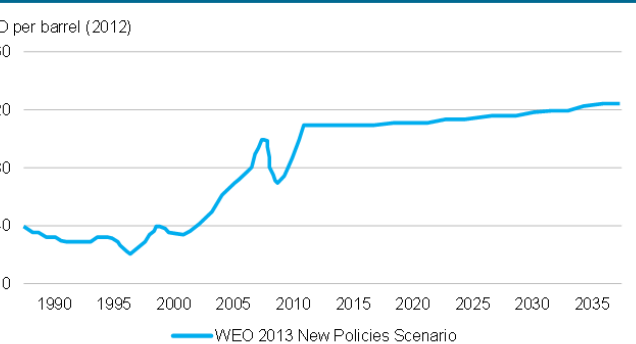


### Natural Gas Demand in Selected Regions

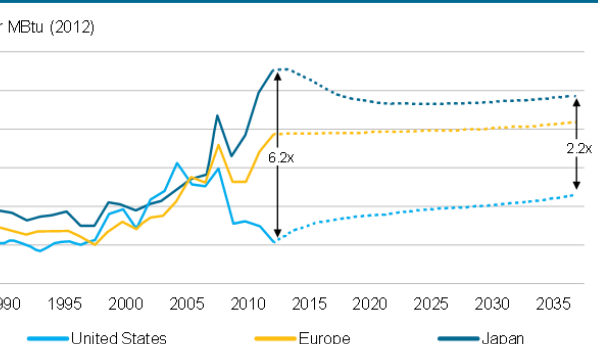


Substantial increase in Oil and Gas demand driven by developing markets  
Source: World Energy Outlook 2013 ©OECD/IEA 2013

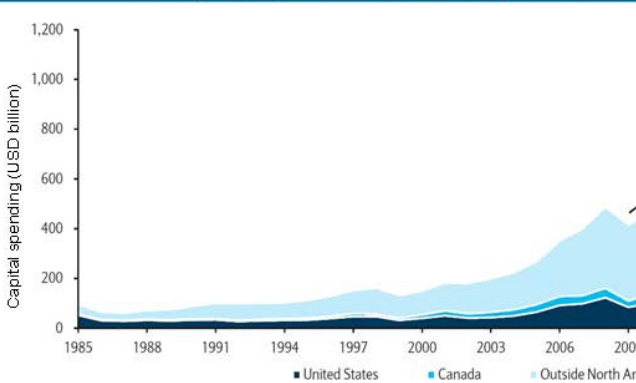
### IEA Crude Oil Price Forecast



### Natural Gas Price Forecast by Region



### Barclays Equity Research Global E&P Spending Outlook



Short-term dip in E&P spent due to equity market pressure  
Long term shift to production growth to respond to energy demand

Sustained high pricing of oil and strong regional demand for gas will attract investments  
Source: World Energy Outlook 2013 ©OECD/IEA & Barclays Equity Research, Global 2014 E&P Spending Update



expenditure from 2013 to 2019, at a CAGR of 15 per cent and 12 per cent, respectively. For both regions, this is expected to mainly be due to a significant increase in capital expenditure in ultra-deepwater, at a CAGR of 43 per cent and 19 per cent. East Africa is also expected to emerge as a new subsea focus region due to the recent gas discoveries that are planned to come on-stream later this decade. The region is expected to see a significant increase in capital expenditure from USD 16 million in 2013 to USD 8.5 billion in 2019, with ultra-deepwater expected to represent the largest share. The outlook for deepwater spending outlined above is supported by In-field Systems, which sees the majority of incremental demand for subsea installations during the forecast period coming from deepwater and ultra-deepwater fields. Furthermore, the upcoming deliveries of deepwater capable drilling units are expected to remove a key bottleneck (rig availability) to offshore developments. June 13, 2014 the global offshore competitive

drilling rig fleet, including drillship, jack-up and semisubmersible types, consisted of 861 units, up from 806 units a year earlier. The expansion of the rig fleet will likely help to lower field development costs in the coming years, given the lower costs of deepwater drilling services in the current market. With drilling accounting for approximately 40 to 50 per cent of offshore field development costs, it is anticipated that the expected reduction in drilling costs to be a significant driver of lower overall development costs and, therefore, to contribute to improving oil companies' return on projects.

**The Importance of Technology Innovation**

Recent period of rapid growth in E&P investments resulted in significant inflation of the cost base and accumulated inefficiencies in project execution. The technology innovation is expected to enable complex field developments (higher water depth, longer step-outs, higher pressure and temperature). However, the technology innovation will also be instrumental to offset the infla-

tion of the cost baseline and improve efficiency. The advancements of the subsea technology is not the only form of innovation. Arguably simplification, standardization and operational efficiency gains are not any easier than incremental technology advancements and may at times require much more technology innovation.

Aker Solutions has developed on this thinking and introduces several key technology initiatives to address standardization, cost efficiency and operational efficiency.

**eField**

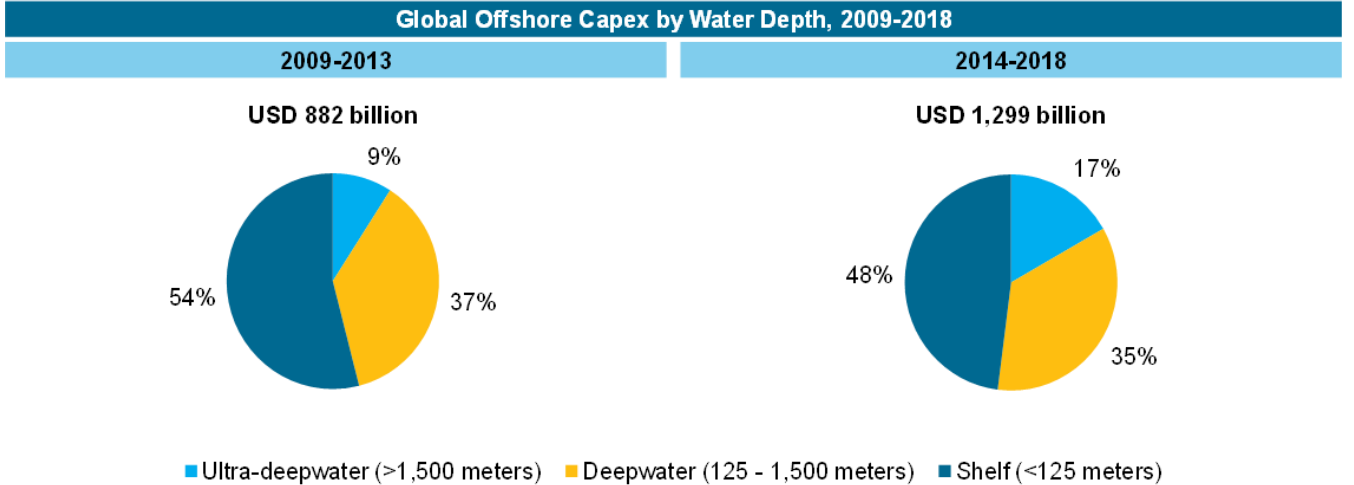
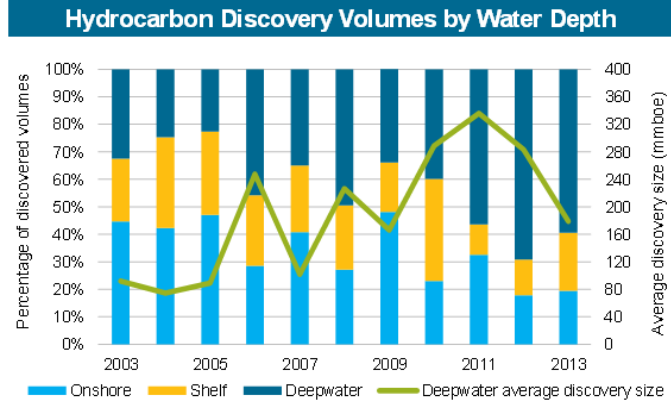
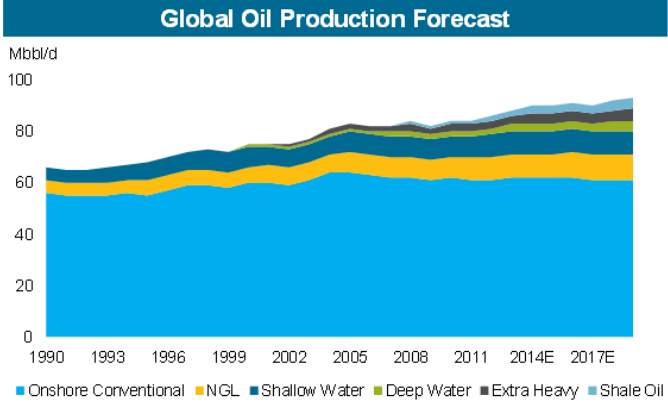
As part of this effort, Aker Solutions is developing a new suite of technology driven services under the eField name. These services are designed to assist the oil companies to leverage data from existing and new field sensors and systems by providing a set of proactive support, maintenance and performance management tools.

Through eField offering, we strive to support our customers in managing up-time of delivered equipment and making informed decisions on

optimizing its performance.

The foundation of eField is fit-for-purpose hardware and instrumentation. This is the hardware layer of the eField system. Each subsea asset designed by Aker Solutions is carefully examined for expected lifetime wear and tear patterns in conjunction with maintenance programs. Based on the thorough understanding of equipment design and operation through the lifecycle, the need for Condition Monitoring instrumentation is derived. eField is utilizing all existing process instrumentation normally supplied with the asset to extract relevant data for Condition Monitoring and Performance Optimization workflows. However, where standard process instrumentation is not sufficient, dedicated eField instrumentation is added to cater for specific needs of Condition Monitoring and Performance Optimization workflows.

The choice of Condition Monitoring instrumentation and its placement / mounting is done with in-depth knowledge of subsea equipment design and condition monitoring / performance optimization needs.



Offshore market will be dominated by recent deep water discoveries securing strong growth in subsea markets

Source: Infield Systems Oil Production Overview as of August 2014 / Wood Mackenzie as of September 2014 & Rystad Energy DCube database, (July 2014)

While eField instrumentation provides means to physically acquire and store data, software applications contain all the logic to perform equipment up-time and performance management. Software applications are developed to focus on individual tasks – such as calculating real-time performance metric for one type of equipment. With this architecture, new applications can be easily added to the overall system, with minimal disruption to the rest of the system allowing for simplified

maintenance and upgrade of the eField system.

**Summary**

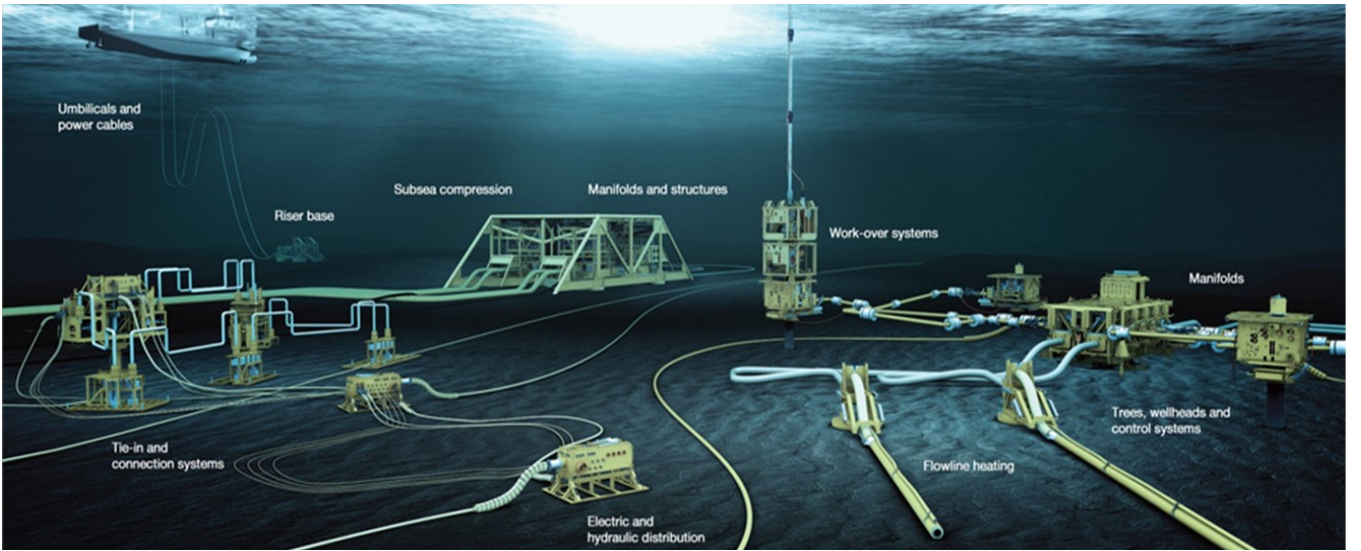
In a long term perspective the world's energy demand will grow supporting an increase of oil and gas price. Unconventional hydrocarbons will play an increasingly significant role in addressing the world's energy demand, but will not offset all the declining production. Conventional development will shift offshore, driving annual growth rates

of offshore developments at around 7%. Moreover, new technology development will enable deepwater developments bringing the growth of around 16% CAGR for subsea markets, mainly within the main markets, in Africa and Brazil.

With the growing complexity of offshore developments, the need for proactive technology-enabled service offerings will emerge. Through the eField offering, Aker Solutions is prepared to play a more active role in helping clients manage the

operational, HSE and financial risks better, as they move towards more complex developments.

*This article includes and is based, inter alia, on forward-looking information and statements that are subject to risks and uncertainties that could cause actual results to differ. Please refer to Aker Solutions' website for more details on the information disclaimer.*



*Strong focus on subsea technologies will offer a compelling solution to enable deep water development*



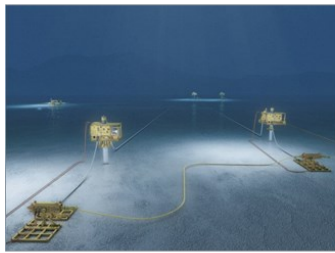
**Monitoring built in**

- Performance & condition monitoring “baked” into hardware
- Re-using existing sensors / data
- New dedicated sensors where they make sense



**Role based and Fit for purpose diagnostic tools**

- Streamlined GUIs for operators & front line service
- More powerful analysis for experts – clients & Aker Solutions



**Automated & secure multi-domain data integration**

- Highly customizable security & remote connectivity options
- Online access extended to ERP data
- Multi-domain data through lifecycle – FAT, operations, maintenance, repair

*Vision: Real-time monitoring, rapid troubleshooting & advanced optimization in a distributed setting*



## Drilling riser monitoring for improved offshore drilling operations

by Gullik A. Jensen, PhD, Global Product Manager Riser Management Solutions, Kongsberg Oil & Gas Technologies



**Gullik A. Jensen**  
PhD /  
Global Product Manager  
Riser Management  
Solutions,  
Kongsberg Oil & Gas  
Technologies

During riser operations in deep water and harsh environments, it may be a challenge to maintain operability and riser integrity. The Riser Management System (RMS) delivered by Kongsberg Oil & Gas Technologies is developed to gather relevant measurements in real time during operations and combine the available information in a way that gives the operator continuous advice on where to position the vessel together with the current operational margins for all parameters associated with the riser. In complex and strong seas, the ability of the RMS system to predict the optimum vessel position, as well as to monitor the full state of the riser has made it a standard system for most new drill vessel builds. Kongsberg has delivered Riser Management Systems since 1995 and is currently the market leader with more than one hundred installations worldwide.

This article gives an introduction to offshore drilling with a marine riser, the loads that the riser is subject to, and the potential failures that may occur. The flex-joint joints that are part of the riser are among the most significant operational parameters that determine if a drilling operation can be performed or continued safely. Knowing the risk and failure modes, mitigation actions to avoid or reduce risk as well as extending the operational window using monitoring and decision support features of RMS are described.

### Offshore drilling vessels

Offshore drilling is performed from floating drillships and drillrigs, commonly termed as a mobile offshore drilling unit (MODU). These drilling vessels are custom build vessels specially designed and equipped for drilling and completing subsea wells. When a new exploration or production well is required, the vessel will arrive at the location, drill the well and then leave for the next assignment. Once the well is prepared, other units designed and equipped for production, such as e.g. a FPSO will be connected to the well. Most of these drilling vessels use dynamic positioning (DP) to keep position during

the drilling operation. That means that they use their thrusters to stay on location instead of anchors. This is an advantage since the time to prepare for the operation is minimized and since anchors are not applicable in deep water. The drillships have a ship shaped hull, and the rigs are platforms with legs standing on pontoons under the waterline. The advantage of the ships is that they can sail faster than a rig between locations, whereas the advantage of the rigs is that they are more stable in heavy seas. In Norwegian waters the rigs dominate, however the majority of new builds are drillships.

The obvious challenge of offshore

drilling is the water, where the drilling equipment is on board the vessel, and the wellhead, which is where the subsea well starts, is on the seabed. The drilling riser is a temporary extension of the subsea wellbore from the stack at the wellhead on the seafloor to the drilling vessel on the surface where the drilling operation is performed. The drillstring, as well as casing and tools, are operated through the riser, and it also serves as a conduit for the circulating drilling fluid during the drilling operation. During the drilling operation, the riser is subject to large loads from the environment in the form of wave and current loads, and from vessel motions.

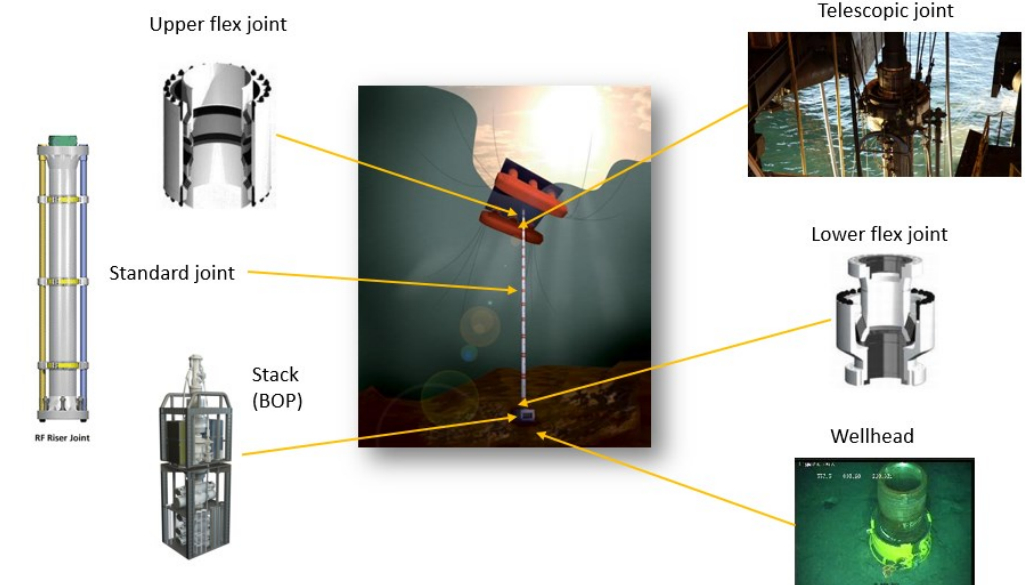


Fig.1 The drilling riser is made up of many joints, some with special purposes

*Drilling riser in operation*



The riser is tensioned at the top to prevent it from collapsing due to its own weight.

**The drilling riser by parts**

The drilling riser is made up of many parts called joints, which are deployed from the vessel for each new well and modified to the water depth at the present location, see Fig.1. Several of the joints deployed in the riser are designed for special purposes. The wellhead is at the bottom fixed to the seabed. It is the termination of the subsea well and is not a part of the riser itself. The lower stack, made up of the blow-out preventer (BOP) and lower marine riser package (LMRP), is latched onto the wellhead and serves as a well control system preventing uncontrolled blowout from the well. At the top of the stack there is a flexible joint, or ball joint, termed the lower flex-joint. If the riser is bent due to environmental loads, this joint will bend to take up the bending moment and protect the BOP and wellhead. Continuing from the lower flex-joint are standard joints with and without buoyancy modules. The riser is fixed to the seabed, but the vessel is moving up and down with the waves. To compensate for this heave motion, a telescopic joint is placed at the top of the riser. This is two moving pipes inside each other where one is fixed to the riser and one is fixed to the vessel, allows the rig to move up and down without damaging the riser. Finally, an upper flex-joint compensates for the vessel roll and pitch motions.

**Riser operation window and failure modes**

These special purpose joints ensure the structural integrity of the riser. The telescopic joint prevents excessive stresses and the flex-joints prevent failure due to excessive bending moments. However, the flex-joint introduces an angled section, a discontinuity, on the riser which it is not possible to drill through if the angle typically exceeds three degrees. The weather offshore can be very rough with large waves and strong and rapidly changing Fig.2 which is borrowed from YouTube and shows the telescopic joint. From this is easy to imagine that the drilling riser can suffer great wear and tear and is subject to failures. Some



Fig.2 The riser may be subject to great loads in bad weather conditions Offshore, sea waves

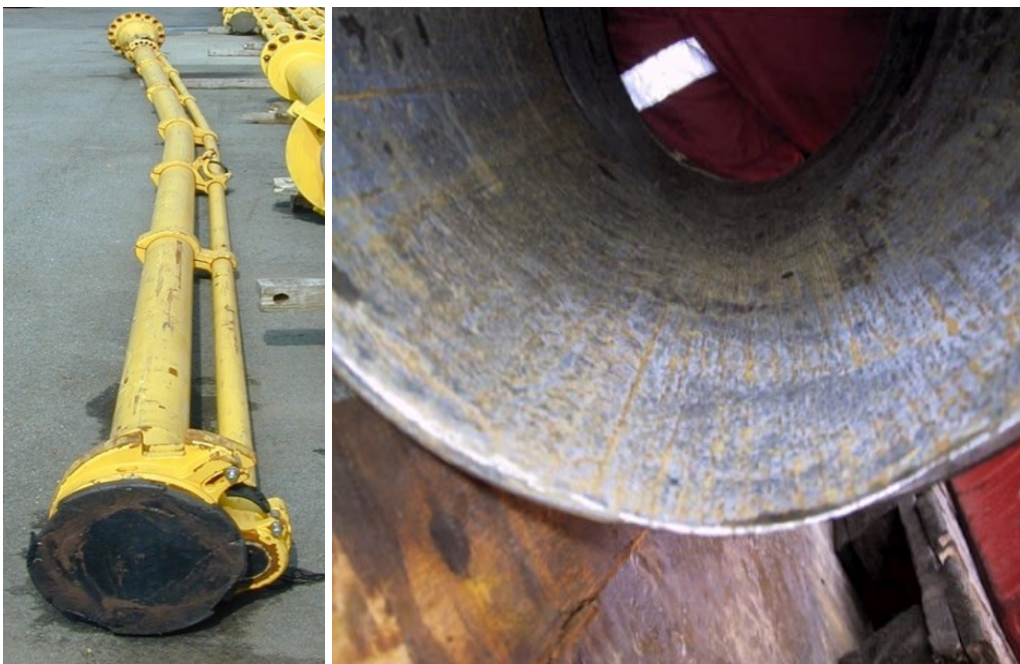


Fig.3 Buckling is the result of insufficient top tension

Fig.4 Key seating is the result of excessive riser angles. Here contact with the drill string has worn down the walls

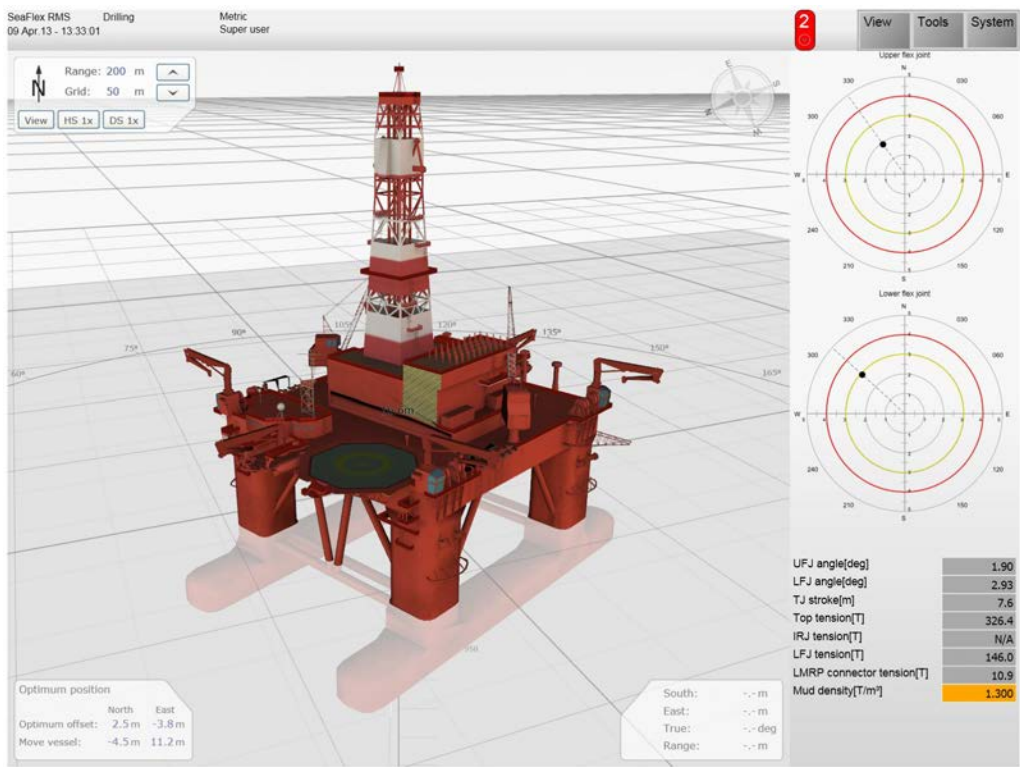


Fig.5 The user interface is important to ensure that the operator has the best possible situational awareness as basis for decision making

examples are buckling, which is due to insufficient top tension, see Fig.3, key seating resulting from excessive riser flex-joint angles causing contact between the drill string and riser wall that can wear down the riser walls, see Fig.4, and rupture which is due to excessive loads or fatigue. Assuming a day rate for a drilling vessel exceeding USD 500,000 the delays caused by such damage is significant, not to mention the cost to replace the equipment and the risk of potential environmental damage from an uncontrolled blow out. It is important to avoid damage on the riser and the wellhead, and a key purpose of operational riser monitoring is to identify the risk for such damage so that corrective action can be performed.

**Operational monitoring**

The Riser Management System (RMS) is a software based solution that combines an advanced numerical model with real-time sensor measurements collected from sensors and systems onboard that affects the riser, such as e.g. the DP system, the drilling control system, the tensioner system, the BOP control system and the acoustic position reference system. To supports the operator in understanding the situation and make the right decisions RMS has introduced a situation view in 3D that allows the operator to navigate in a virtual space to inspect different aspects of the current operational situation, either by taking a step back for overview, or by zooming in to examine the details. The advantage of this technology is the improved operator perception of the actual situation that contributes to enhanced situation awareness. Examples of the situation view are shown in Fig. 5, 6, and 7.

**Reducing nonproductive time**

But RMS can do better than just presenting data and monitoring with alarms on critical operational parameters. When the collected real-time data is combined with the embedded engineering know-how, the system can provide the operator with something more valuable, decision support. In this way the system can contribute to eliminating guesswork and sub optimal solutions. The advantage is reduced risk, reduced down-time and reduced

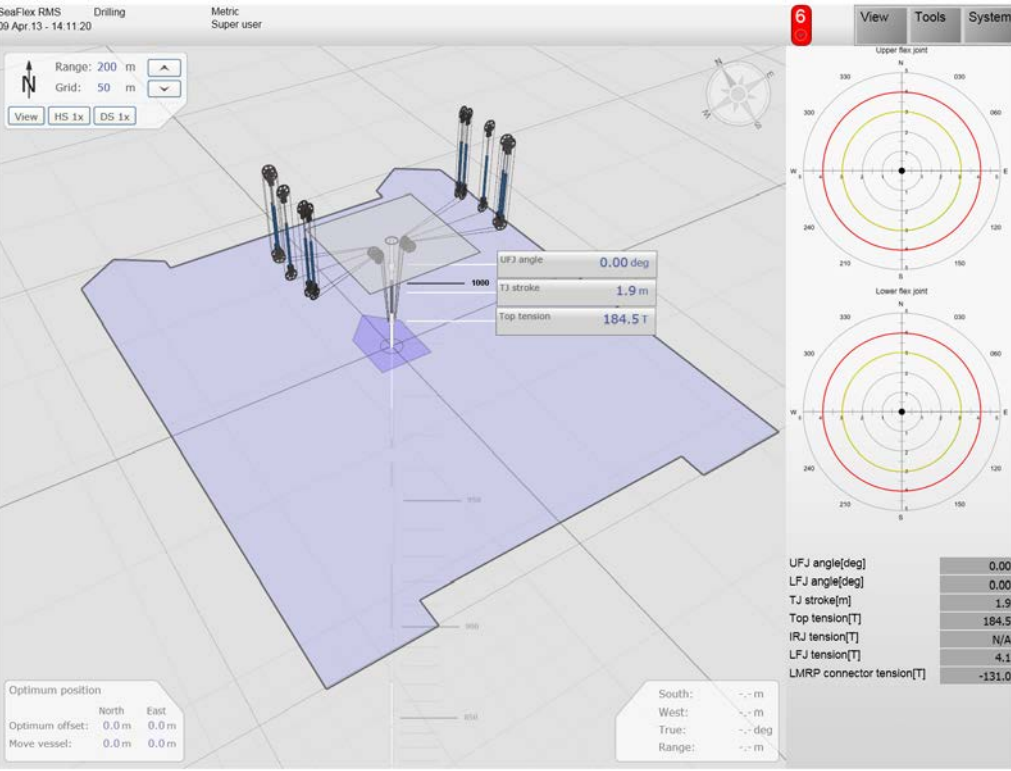


Fig.6 The tension system is one of many subsystems that can be investigated through the RMS user interface

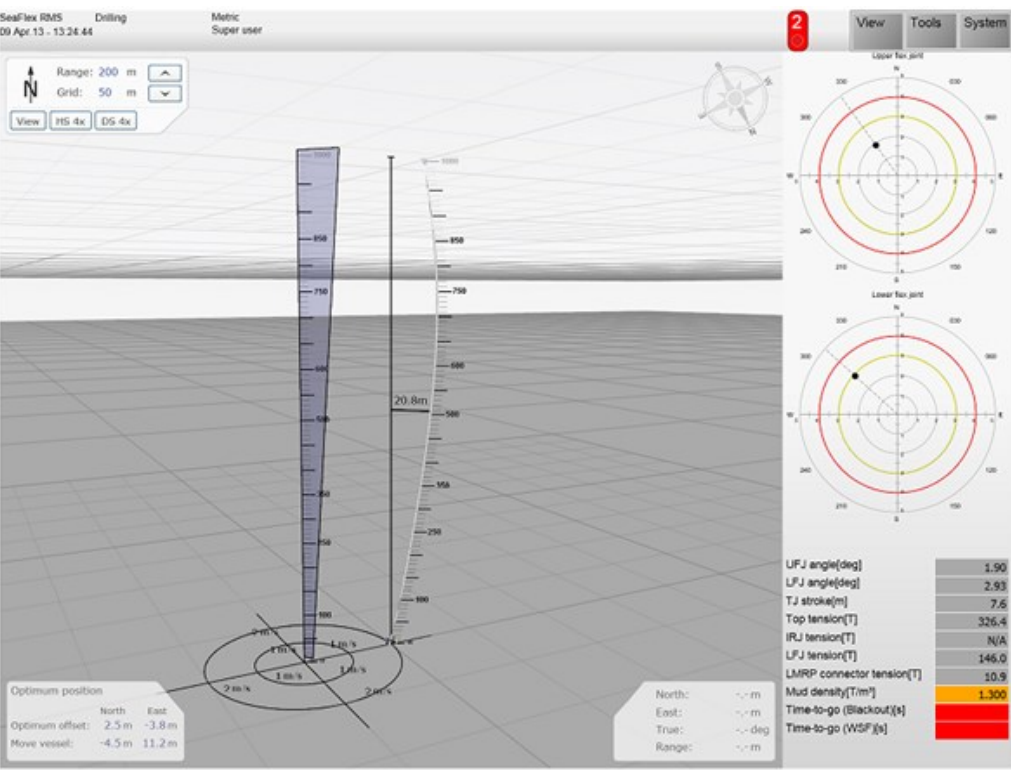


Fig.7 Riser shape and ocean current profile visualized in RMS allows the operator to take a step back and view the full riser shape

wear and tear of the equipment. Recall that the most critical operational parameters are the flex-joint angles and the telescopic joint stroke. Neither of which can be directly manipulated by the operator. There is a linear relationship between the flex joint angles and the vessel offset that RMS exploits to transfer the operational limits to vessel positions on the surface. The system can then determine the surface vessel positions that will keep the upper and lower flex-joints within the operation limits respectively, and also the optimum position that will minimize the angles. By following this advice and tracking the optimum position, the operation window for the vessel can be extended, even when the environ-



mental loads are significant. The optimum position and the dynamically computed operational limits used for position advice are shown in Fig.8.

**Future applications of the Riser Management System**  
With the current trends in the industry, operations are becoming more and more challenging, introducing heavier equipment, deeper waters and harsher environments. At the same time the average level of experience of offshore operators is dropping. This emphasizes the need for operational tools for decision support in operations, such as the RMS, for ensuring save and optimal drilling operations in the future.

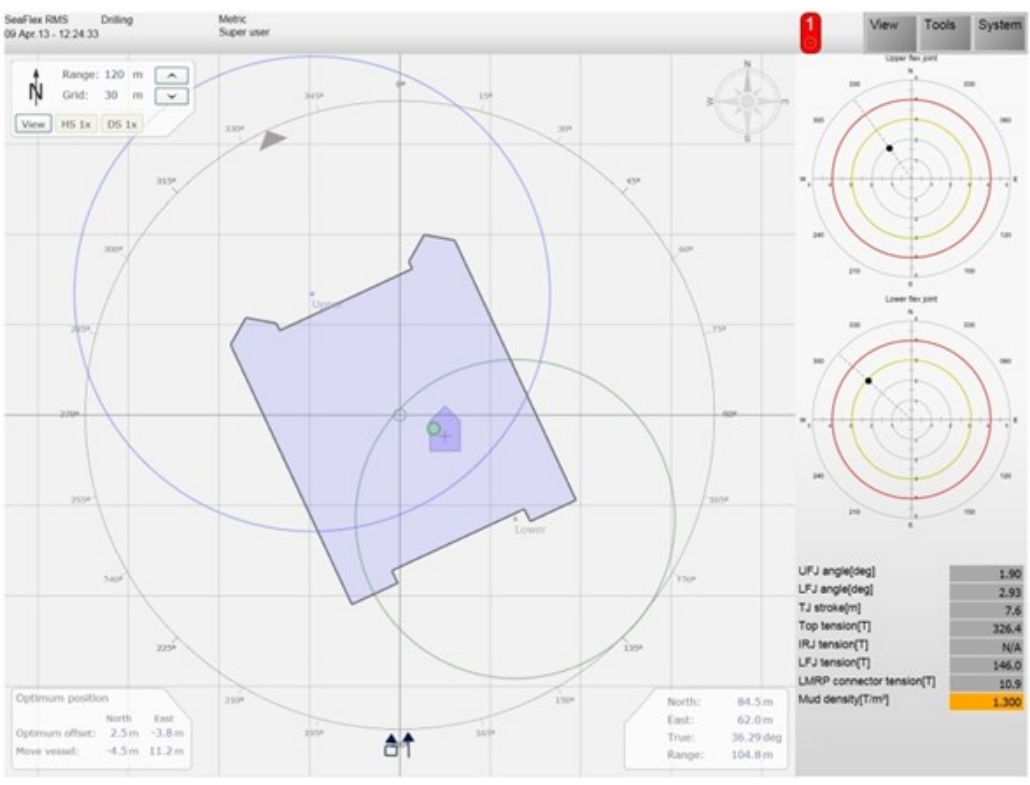


Fig.8 The optimum position advice is the most important system feature. Following the optimum position advice may increase the operation window



# Insight into Upper Triassic depositional environments and stratigraphy from the Svalbard Archipelago, inferred from palynology, sedimentary organic matter and geochemistry

by Steven Mueller (University of Oslo), [steven.mueller@geo.uio.no](mailto:steven.mueller@geo.uio.no)



**Steven Mueller**  
Steven received a Master's degree in Integrated Petroleum Geosciences from the University of Aberdeen and is currently working as a PhD candidate in the Geosciences Department in Oslo

Insight into Upper Triassic depositional environments and stratigraphy from the Svalbard Archipelago, inferred from palynology, sedimentary organic matter and geochemistry.

The Barents Sea and Svalbard Archipelago are increasingly the focus of academic research. This is primarily related to the regions hydrocarbon prospectivity and the UNIS CO<sub>2</sub> storage project in Spitsbergen. Outcrop samples from Juvdalskampen and Botneheia sections from central Spitsbergen are used to reconstruct the depositional environment and to correlate the Triassic Kapp Toscana Group with the regional stratigraphic frame. This is approached by an integrated sedimentary organic matter and bio- and bulk carbon isotope stratigraphic study. The interval studied is the lateral equivalent of the Snadd Formation in the Barents Sea. These formations consist of alternating mudstone and sandstone sequences with an overall increase in sandstone from the base to the top. Previous studies described that the Svalbard Archipelago was located at the northern rim of the supercontinent Pangaea in a shallow shelf setting at the time of deposition about 220 Ma ago. Over time progradation of deltas converted the shallow marine environment into a paralic setting with deposition of terrestrial sediments. In this study a total of 60 samples were evaluated. The organic matter was mounted on microscope slides and carbon isotope values were measured for intersection correlation. The top of the Botneheia Formation contains increased amorphous organic matter and palynomorphs indicative for a restricted environment. Above, the Tschermakfjellet Formation is dominated by terrestrial organic matter, with occasional marine forms therefore presumably deposited in a prodelta setting. The overlying De Geerdalen Formation is dominated by degraded plant debris and wood particles and towards the top of the formation the amount of freshwater forms increases. Together with superabundance of certain spores taxa and thin coal seams results in this being indicative of a terrestrial humid swamp setting. Finally, the Knorringsfjellet Formation is characterized by an increase in marine palynomorphs. This indicates a transgression and shift back to shallow marine shelf conditions as part of a new depositional cycle. The interval is subdivided into five biostratigraphic zones. Each zone is characterized by distinct assemblages of palynomorphs which can be used for correlation, plus integrated with regional palynomorph schemes. Bulk carbon isotope values then also allow independent correlation. The results indicate a Carnian age for the whole succession. In more detail, the Tschermakfjellet Formation is of Julian 1/I age and the De Geerdalen Formation of Julian 1/II to Julian 2 age.

Mueller, S., Hounslow, M.W. & Kürschner, W.M. (under review). Integrated palyno-, magneto- and carbon-isotope stratigraphy of the Upper Triassic Kapp Toscana Group in central Spitsbergen (Norway).  
Mueller, S., Veld, H., Nagy, J. & Kürschner, W.M., 2014. Depositional history of the Upper Triassic Kapp Toscana Group on Svalbard, Norway, inferred from palynofacies analysis and organic geochemistry. *Sedimentary Geology* 310, 16-29. DOI: 10.1016/j.sedgeo.2014.06.003

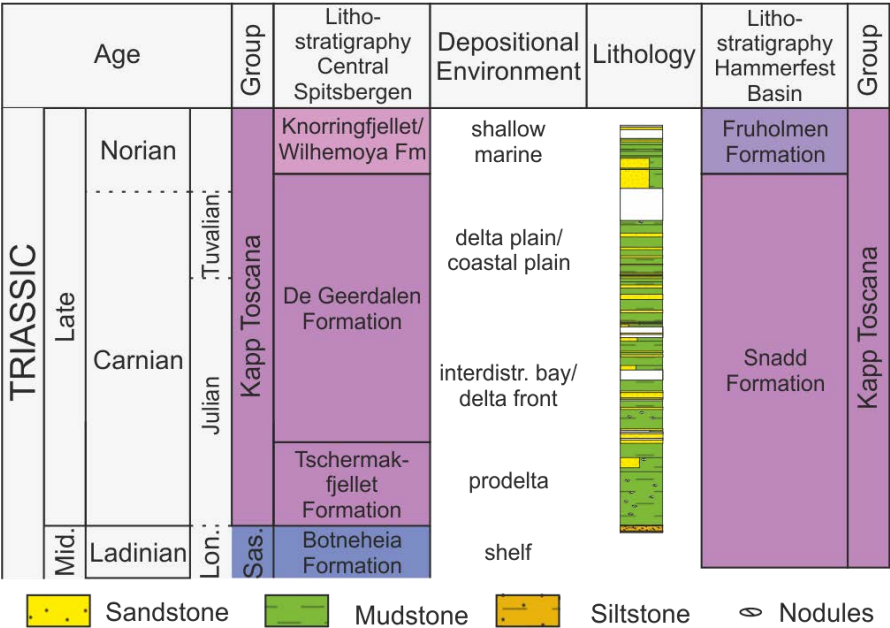


Fig.1: Summary of depositional environments and regional stratigraphy of the Kapp Toscana Group from central Spitsbergen



## Experiencing geology from different perspectives: from Costa Rica to Norway

by Andrés Ulloa Carmiol, PSS-Geo AS, [adres@pss-geo.com](mailto:adres@pss-geo.com)



**Andrés Ulloa  
Carmiol**

*Geophysicist  
PSS-Geo AS/  
PhD Student  
Karst Research Institute  
ZRC SAZU of  
Postojna, Slovenia*

**From Costa Rica to Norway**  
Costa Rica is well-known around the world for its absence of army, high level of biodiversity and being one of the happiest countries in the world. Besides, Costa Rica is the limit of a convergent plate border between Cocos and Caribe Plates, causing an active volcanic arc, with active tectonics associated and many other geological features around the country. In other words, Costa Rica is a “playground” for geologists and explorers interested in solving the “geological puzzle”. For me geology is a passion. Close to my ending of Geology carrier, I

work in geophysics for the oil industry with PSS-Geo. My background was not exactly geophysics, but with the company training, I engaged increasingly in the profession.

### Studying caves and karst

When I came to Norway, I also found the opportunity of studying in the Karst Research Institute ZRC SAZU of Postojna, Slovenia. This institution offers a flexible PhD program in Karstology that allows me to work and study at the same time. Thus, as a person in a new country without “social distrac-

throughout the world are associated with karstified formations and exhibit highly varying properties (e.g., porosity, permeability, flow mechanisms). Hence, an interesting application is to use the hypogenic speleogenesis models in which  $H_2S$  dissolution mechanisms are involved, as analogous models for understanding carbonate reservoirs.

### Irazú volcano and its caves in Costa Rica

Irazú Volcano is the highest volcano in Costa Rica (altitude 3432 m asl), part of an andesitic shield located in the southeast of the Central Volcan-



*Going down to crater of the volcano. Photo: Ronald Ramírez*

worked in unexplored high mountains of Costa Rica inside the dense jungle, for studying geochemical characteristics that became clues to the geochemical evolution of the country. Also, I collaborated in diverse vulcanological and neotectonical projects in Central America. But, when I discovered the “underworld” I got deeply involved in speleology (study of caves) and in related projects of research around of Central America, Caribbean and Mexico. More than one year ago, I got the opportunity to

tions”, I have been focusing in working, taking courses of the program and doing my research project in mineralogy and geomicrobiology of Central American caves and the implications for presence of life in extreme environments.

Combining studies in karst, caves, mineralogy, geophysics and geochemistry can be a bit tricky, but yet, several of the newest solutions and techniques in the industry will need to be analyzed in a multidisciplinary way. For example, many important deposits of hydrocarbons

ic Range. It has been hiding the most amazing volcanic caves discovered in the region. The NW sector of the Irazú volcano is the least explored and studied due to factors such as difficult access and hazardous, unstable terrain. These conditions allowed the caves to remain hidden for several years. In 2011 together with the local caving group (*Grupo Espeleológico Anthros*) we organized the first speleological explorations that entail to one of the greatest discoveries of caves in Costa Rica. Influenced by

*Irazú volcano and caves map*



the active volcano, the caves at Irazú volcano presents the highest mineral diversity in the region, and probably ranks amongst the highest in the world.

First results about the mineralogy of *Cueva los Minerales* were published by Ulloa et al (2013), in which different cave minerals (speleothems) and mineralogy was reported. Twenty

one different minerals were reported relating to sulfates and one native element (Sulfur). Five of these were reported for the first time as cave minerals in the world. This

was a very significant finding that makes these caves unique in the world of vulcanospeleology. Actually, more detailed minerals analyzes are being carried out in Spain with



*Hiking on a very steep track in the way to the caves. Photo: Scott Trescott*





*Green stalactite of melanterite  
in Cueva los Minerales*





“Snotites” in Cueva de los Mucolitos. Photo: Andrés Ulloa

collaboration with University of Valladolid, University of Almería and *Unidad Asociada Uva-CSIC- al centro de Astrobiología CSIC-INTA “ERICA”*. In the three caves discovered in the

surroundings of Irazú volcano, extremophile microorganisms have also been found. These organisms are known as “snottites” based on their morphology. It is common to find them hanging and growing on

mineral substrates, while others are associated with mineral precipitations. Most of them are living at low pH (< 2), and in order to fulfill their characterization, further analyses (biochemical and metagenomic

investigations) are going to be realized in United States.

**Perspectives in mineralogical and geomicrobiological studies in volcanic caves**

Mineralogy in volcanic caves and geomicrobiology are relatively new, yet extremely promising research areas. In the last decade, there has been an increasing number of geomicrobiological studies that showed the role of microorganisms on speleothem formation, speleogenesis and interaction between microbes and minerals. The science of geomicrobiology recognized that microorganisms are promoters of redox reactions that can influence geological formation (Ehrlich, 1996). In caves or other dark environments, such as deep-sea hydrothermal vents, energy can be produced efficiently by chemolithoautotrophy (Engel, 2007). One interesting aspect of vulcanospeleology is the possibility to extend the field of study to other planets and moons, particularly our moon, Mars, and also Venus, and Jupiter’s moon Io (Léveillé & Datta, 2010). Most of the caves on Earth are dissolution caves. But in the solar system probably most of them are volcanic caves; an assumption made based on the predominance of



Andrés sampling a geysermite for mineral analyses. Use of mask is necessary in some parts of the cave because of high concentration of volcanic gases. Photo: Scott Trescott



Gringo Loco

Mineral and geomicrobiological sampling. Photo: Scott Trescott

basalts on planets and moons and the lack of solvents (e.g. liquid water). If life exists on other planetary

bodies of the solar system, most likely it will be found in subterranean environments due to planetary

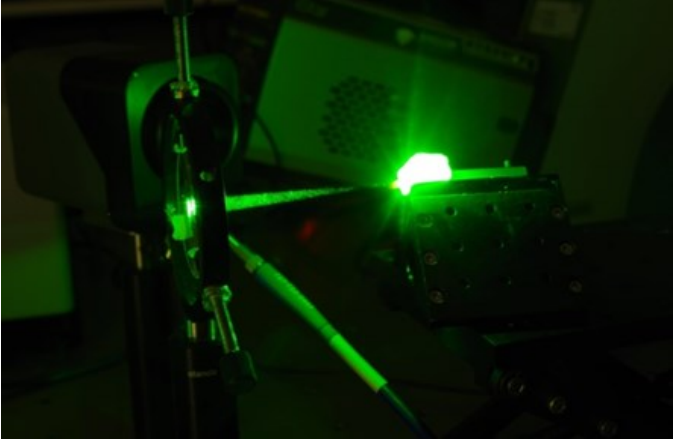
challenging surface conditions (Boston et al. 1992). For this reason, caves serve as terrestrial analogs for

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Left: sulfur crystals. Photo: Scott Trescott. Right: geysermite. Photo Victor Carvajal








Left: LIBS (Laser-induced breakdown spectroscopy) analyses in a mineral sample. Photo: Andrés Ulloa. Right SEM (Scanning Electron Microscope) image of diverse sulphates



	Events SPE Oslo 2014-2015 season	
17:30 26 November 2014	YP: Oil and Gas Quiz 3 Olivia Aker Brygge Stranden 3, 0250 Oslo	
2 December 2014	Meeting and Technical event: (Christmas Dinner)  <b>Evaluating Polymer and WAG on Johan Sverdup Using New Generation Simulator</b> <i>Geir Magnus Sæternes, Lundin Petroleum; Jens-Petter Nørgård, Lundin Petroleum; Dmitry Eydinov, RFDY (iNavigator)</i> <b>DNO International Lessons and Experiences: Kurdish Delight</b> <i>Håvard Morset Klokke, Development Manager, Kurdistan Subsurface</i>	
18:00 20 January 2015	<b>Distinguished Lecturer-i: Dinner</b> Arild Saasen “Drilling Fluid Influenced Magnetic Shielding of Directional Measurement Tools: Causes and Consequences” <i>Arild Saasen has been a technology adviser at Det norske oljeselskap in Oslo, Norway, since January 2009. He is also an adjunct professor in drilling and well fluids at the department of petroleum engineering at the University of Stavanger. Saasen holds an MS degree from the University of Oslo and a PhD degree from the Technical University of Denmark, Lyngby. In 2012, he was awarded the Carl Clason Nordic rheology prize.</i> Hotel Continental, Stortingsgata 24-26, 0117 Oslo	
17:30 28 January 2015	YP: Oil and Gas Quiz 4 Olivia Aker Brygge Stranden 3, 0250 Oslo	
10 February 2015	<b>Big Data Solutions &amp; Analytics in Oil and Gas Industry</b> (Full day event · dinner) <i>Conference and Exhibition</i>	
18:00 10 March 2015	<b>Distinguished Lecturer-ii: Dinner</b> James Hemingway “Comparing Formation Evaluation Measurements Made Through Casing With Openhole Logging Measurements” <i>James Hemingway started at Schlumberger in 1980 and has held various petrophysics and engineering positions since 1982. He moved to Paris in 2001 as a new technology adviser and has been based in Houston since 2010 as a petrophysics adviser focusing on unconventional resources. Hemingway has been heavily involved in reservoir monitoring of enhanced oil recovery operations using techniques designed for use in cased wellbores. He holds degrees in chemistry and chemical engineering.</i> Hotel Continental, Stortingsgata 24-26, 0117 Oslo	
18:00 7 April 2015	YP: (presentation and dinner)	
21 April 2015 or June (Planned date)	Annual SPE Oslo event with Oslo Børs/PwC: Full day Seminar Risks and Rewards in Oil and Gas	
18:00 19 May 2015	<b>Distinguished Lecturer-iii: Dinner</b> Klaus Potsch “Understanding and Checking the Validity of PVT Reports” Klaus Potsch is a retired senior expert from OMV and a consultant for fluid studies. For the past 4 years, he has been a guest lecturer in reservoir fluids and their modeling at the Mining University of Leoben, Austria. Potsch holds BS and MS degrees in physics and a PhD degree in mechanical engineering from the Technical University of Vienna. Hotel Continental, Stortingsgata 24-26, 0117 Oslo	

\*\*\*The meeting time, place or topic could be changed, please follow information on <http://oslo.spe.org/> Events





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