



SOCIETY OF PETROLEUM ENGINEERS

# SPE NEWS

COPENHAGEN SECTION

## CONTENT

### PAGE

- 2 **Culzean: Building a 21<sup>st</sup> Century Platform**
- 5 **Improved Wellbore Stability through Shale-Fluid Compatibility Optimization**
- 8 **Working with Safety – The Safe Way Conduct**
- 10 **A Successful Hejre Drilling Campaign – How to plan your Luck & Improve – as a Habit**
- 11 **How Can Computational Fluid Dynamics Improve Reservoir Simulations and Completion Strategies?**

## FUTURE MEETINGS

FOR MORE INFORMATION REGARDING THE PROGRAMME SEE PAGE 4

## MAINTAINING CAPABILITIES IN A SHRINKING BUSINESS ENVIRONMENT

It's no secret to say that the oil business has seen better times. Even while the oil price is recovering from historic lows the impact of the downturn on the community of petroleum professionals in Copenhagen is as palpable as it is in oil cities such as Aberdeen and Stavanger. Companies in our business are downsizing their staff pools, while consolidating in the Esbjerg area for efficiency reasons, and are putting projects on hold in anticipation of higher product prices and a more favourable fiscal regime – which may or may not happen.

There is a real danger that halted projects in the Danish sector will never go ahead: ageing infrastructure will eventually require replacement narrowing the window of opportunity, and essential capabilities are rapidly being drained as local staff are turning to other industries while impatriated staff are leaving the country. When the upswing happens there may simply not be sufficient capacity and skills left in areas such as front end loading or development planning.

Government can play a constructive role in this environment, even though it isn't clear whether the political will is there given the prioritisation of renewables over fossil fuels, by providing a context that supports development activities and continuity in the oil and gas business through sustainable tax policies. It may be useful to take note of lessons learned

from the decline in UK manufacturing capacity in the second half of the last century which was characterised by ideological disputes between political parties, and erratic government policies towards business. As the former civil servant Chris Benjamin had concluded in his book 'Strutting on Thin Air': "The underlying essential for industrial success is 'continuity'... Continuity fosters consistent focus, expertise evolved over decades and pursuit of research, innovation and knowledge application to secure the feedback for 'increasing returns'."

The SPE is not a mere bystander in this spectacle. Its role is to help engineers develop their professional career, by providing a blend of knowledge and networking. The networking can of course go different ways, it can help organically strengthen capabilities of those remaining in the chapter but it also helps professionals find new opportunities, often overseas which may result in acceleration of an oil capability brain drain. 'Time is money' goes the saying, but for the sake of Danish energy sufficiency let's hope government and business will find common ground soon. Time will tell.

**Hans Horikx**  
**Copenhagen SPE Chairman**



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# CULZEAN: BUILDING A 21<sup>ST</sup> CENTURY PLATFORM

**As Culzean continues to notch up key milestones, Project Director Martin Urquhart reveals how the facilities for Maersk Oil's North Sea megaproject are being future-proofed to deliver a truly 21<sup>st</sup> century platform.**

With new projects there is a precious opportunity, pre-fabrication, to design in mitigations and efficiencies which incorporate the lessons of the past. In opting for the final Culzean design, the team has sought to minimise risk, but also leverage the early investment to reduce operational expenditure (OPEX) through the lifecycle.

“Because of the nature of dry tree high pressure, high temperature (HPHT) developments, fully automating Culzean would come with a number of unique challenges and regular human intervention is required in a number of areas, especially later in well life.

“As such, we have embraced technology that ensures we instead minimise the number of people offshore. This will allow positions that would traditionally have been on the platform to be onshore, working in a real-time collaborative environment,” enthuses Martin Urquhart, Culzean Project Director.

The driver behind that is risk mitigation and efficient operations. The highest industry risk is helicopter transportation, so the fewer personnel offshore the better. The efficiency simply comes through doing things smarter.

Today, advanced communications through software and systems, hand held devices, Radio Frequency Identification (RFID) tags on equipment and scanners, can combine offshore to allow for monitoring and maintenance operations to be carried out, recorded and uploaded to systems instantly.

“Understandably, the focus on the capital expenditure (CAPEX) phase of a new development tends to be the most intense. But any new project with thorough front end loading will be planning facilities for the OPEX phase of the project simultaneously,” says Martin.

In the “lower for longer” cost environment, failing to build-in the ability to minimise the cost of operation once in production means missing a big opportunity. Maersk Oil's Culzean platform has harnessed relatively new, but widely available technology to build a 21st century facility, with efficiency integrated at every stage of the design phase.

That has meant ensuring the primary critical equipment suppliers are in the chain of communication from the beginning. “We've taken the view that the people who know their own equipment are best placed to work with our experts on how to predictably maintain and improve the overall reliability of the equipment,” he explains.

The up-front investment in the facilities, such as in the laying of fibre-optic cables and robust and secure wi-fi networks will allow Maersk Oil to optimise production efficiency, boost up-time, and run a safer, more reliable plant.

# ENTURY PLATFORM

## QUALITY TIME

It is estimated that up to 20-30% of an offshore operator's time is spent seeking data in order to be able to perform a task. That's hours every day looking for work sheets, valve specs and procedures. Better data management on the worksite can significantly reduce this by providing real-time information.

On critical equipment on the Culzean platform, Maersk Oil will attach RFID tags. These tags, when scanned using a handheld device such as a tablet, provide the operator with all the information associated with that piece of equipment in real-time. The information will include manufacturing data and certificates, drawings, video simulation of maintenance and operations activities, maintenance history and so on.

The operator will also be able to perform routine maintenance by completing a procedure prompted by a checklist on the tablet. As the decks of Culzean will be flooded with wi-fi, any areas of non-compli-

ance are instantly synchronised with the master data set and automatic notifications posted to the relevant operations management and support teams on and offshore. The operator can share photos and comments and these can be associated with the task and stored for future reference. Any actions generated are assigned a priority dependent on the criticality of the equipment and closure is tracked using standard reporting dashboards.

## CASH CONSERVER

"The full potential is still being mapped out, but in terms of managing quality – just in terms of being absolutely certain that the critical component being ordered is exactly what you need every single time – that alone is going to reduce unplanned downtime and that means better production efficiency over the coming decades – and that cash flow really adds up," he says.



Applying these technology enhancements to Culzean could provide efficiency savings of at least USD10 million per annum, as the iPad and tablet joins the wrench and screwdriver as standard pieces of equipment on North Sea developments of the future.

By allowing the operator to be as efficient as possible it supports both the minimum manning philosophy, enhancing safety by reducing time on plant, and reducing cost, through greater productive tool time and better understanding of the failure patterns and inventory.

“This is a good example of the evolving relationship between operators and suppliers towards one of innovation, creativity and collaboration, rather than the purely transactional or contractual one that has historically existed. And now is the right time to be thinking hard about new models of working with each other, the time to put in place models which offer some protection against the cyclicity that is a fact of life in this industry,” concludes Martin.

## STABLE CABLES

Fibre optic communication has the power to revolutionise operations offshore.

High capacity broadband access enables faster and improved decision making, increased efficiency and major cost savings.

“The volume of data our smart platform will generate demands a subsea fibre optic cable, which allows for instant distribution of critical data from offshore operations. It will mean we can benefit from our own, and key equipment vendor’s global expertise without the need for these experts to be physically offshore.”

## FEBRUARY TALK:

# CULZEAN: TECHNOLOGY ENABLING PEOPLE

## BIOGRAPHY



**Peter Hepburn – Director, Maersk Oil UK**

Peter joined Maersk Oil UK in January 2007 as a Management Systems Advisor working on the Gryphon FPSO and Janice FPU. He stayed in this role until March 2009 when he was promoted to Production Assistant as part of his development towards OIM. In May 2010 he became an OIM on the Gryphon FPSO and in 2011 transferred to the GPIII FPSO. During this time the McKinsey & Company Production Performance Database 2012 benchmarking survey named the GPIII as the safest FPSO for personal safety in the UK North Sea. In August 2013 Peter was promoted to the position of Director, HSSEQ for Maersk Oil UK and drove improvements in both personal and process safety. In December 2016 Peter was promoted to the position of Director, Operations for MOUK and is turning this drive to achieving top quartile operational excellence in the business unit.

Peter is a Chartered Engineer with an MSc in Process Technology and Management and a BEng (Hons) degree in Process Engineering. Prior to working in the Offshore Oil and Gas industry he has held Health and Safety, Engineering and Operations positions within the onshore petro-chemical, power generation and manufacturing industries. ◀

## IMPROVED WELLBORE STABILITY THROUGH SHALE-FLUID COMPATIBILITY OPTIMIZATION

Wells drilled by Maersk Oil in the Danish sector of the North Sea have historically suffered from borehole instability problems when intersecting the Upper/Lower Lark and Horda shale formations using either water-based mud (WBM) or oil-based mud (OBM). A state-of-the-art experimental rock mechanics and shale-fluids compatibility investigation was carried out featuring X-ray diffraction and cation exchange capacity characterizations, shale accretion, cuttings dispersion, Mohr-Coulomb failure, mud pressure transmission and a new type of borehole collapse test for 11 different mud systems (WBM, OBM and high-performance WBM). The results of this investigation were then combined with the results of a comprehensive well lookback study as well as a mud weight evaluation study using sophisticated elasto-plastic mud weight simulation. The integrated study clearly identified the root cause(s) of the Tor/Ekofisk well problems and highlighted comprehensive practical solutions, which were subsequently implemented in the field. ◀

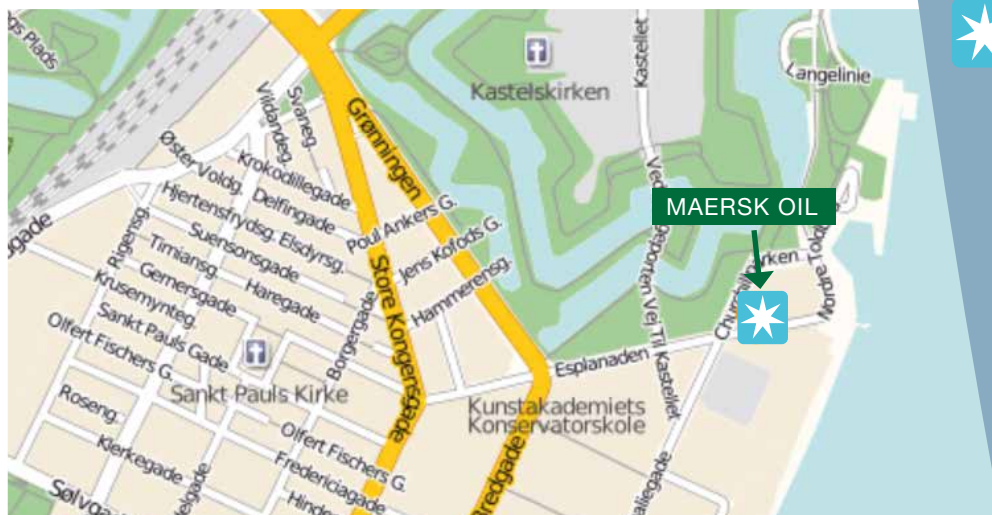
## BIOGRAPHY



**Jedrzej Bryla, Maersk Oil**

Jedrzej graduated in 2009 from AGH University of Science and Technology in Cracow, Poland, with an MSc in Drilling Engineering.

After leaving University, he joined Maersk Oil and completed the MITAS programme working offshore in Denmark and Qatar, with a brief spell as a Reservoir Engineer. Since 2012 he has worked as a Drilling Engineer in DUC on a myriad of projects, ranging from drilling infill wells, exploration drilling, workovers and P&As. He is currently involved in the Tyra Future Project. Jedrzej served as the Young Professionals Chairman from mid 2012 to mid 2015. He has two young children and in his spare time enjoys working on his start-up. ◀



### PROGRAMME

17:00 - 18:00  
DRINKS

18:00 - 19:00  
PRESENTATION AND SPE NEWS

19:00 - 21:00  
DINNER

### LOCATION

Maersk Oil  
Esplanaden 50  
1263 København K

### SPEAKER

Peter Hepburn, Maersk Oil

### TOPIC

Culzean: Technology Enabling People

### DINNER SPEAKERS

Jedrzej Bryla, Maersk Oil

### TOPIC

Improved Wellbore Stability through Shale-Fluid Compatibility Optimization

### ENTRANCE FEE

None

### REGISTRATION

Please indicate your attendance by Friday 17 February 2017 by signing up on the internet [www.spe-cph.dk](http://www.spe-cph.dk)

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<b>September 22</b>	<b>MAIN SPEAKER</b>	<b>AFTER DINNER</b>
TOPIC	<b>Brent Decommissioning - Next steps</b>	
SPEAKER	Duncan Manning, Shell	
LOCATION	Charlottehaven	
SPONSOR	Shell	
<b>October 26</b>	<b>MAIN SPEAKER</b>	<b>AFTER DINNER</b>
TOPIC	<b>Human Factors in Barrier Thinking</b>	Optimized well design for shallow reservoirs. <i>Speaker: Johnny Bårdsen, Welltec</i>
SPEAKER	Ronald McLeod (SPE DL)	
LOCATION	Welltec	
SPONSOR	Welltec	
<b>November 23</b>	<b>MAIN SPEAKER</b>	<b>AFTER DINNER</b>
TOPIC	<b>Particles in Pores: Enemies and Friends Mineral Precipitation from Brines What Makes Chalk Stick Together</b>	My Experience in Enhanced Oil Recovery Research: A Third of a Century Retold in a Third of an Hour. <i>Speaker: Erling H. Stenby, Head of the Chemistry Department at DTU</i>
SPEAKER	Alexander A. Shapiro, Associate Professor at CERE Kaj Thomsen, Associate Professor at CERE Ida L. Fabricius, Associate Professor at CERE	
LOCATION	DTU	
SPONSOR	DTU	
<b>January 25</b>	<b>MAIN SPEAKER</b>	<b>AFTER DINNER</b>
TOPIC	<b>How can Microfracturing Improve Reservoir Management?</b>	South Arne – Ocean Bottom Seismic. <i>Speakers: Christian Rau Schiott, Hess Marianne Rosengreen, Hess</i>
SPEAKER	Mayank Malik (SPE DL)	
LOCATION	Moltkes Palæ	
SPONSOR	Hess	
<b>February 23</b>	<b>MAIN SPEAKER</b>	<b>AFTER DINNER</b>
TOPIC	<b>Culzean: Technology Enabling People</b>	Improved Wellbore Stability through Shale-Fluid Compatibility Optimization <i>Speaker: Jędrzej Bryła, Maersk Oil</i>
SPEAKER	Peter Hepburn, Maersk	
LOCATION	Maersk	
SPONSOR	Maersk	
<b>March 14</b>	<b>MAIN SPEAKER</b>	<b>AFTER DINNER</b>
TOPIC	<b>A Successful Hejre Drilling Campaign – How to plan your Luck &amp; Improve – as a Habit</b>	How Can Computational Fluid Dynamics Improve Reservoir Simulations and Completion Strategies? <i>Speakers: Kenny Krogh Nielsen, Lloyd's Register, and Casper Schytte Hemmingsen, DTU</i>
SPEAKER	Peter V. Balslev, Dong	
LOCATION	DONG	
SPONSOR	DONG	
<b>April 25</b>	<b>MAIN SPEAKER</b>	<b>AFTER DINNER</b>
TOPIC	<b>Shale Gas Evaluation</b>	
SPEAKER	Niels Schovsbo, GEUS	
LOCATION	GEUS	
SPONSOR	GEUS	
<b>May 23</b>	<b>MAIN SPEAKER</b>	<b>AFTER DINNER</b>
TOPIC	<b>Creating Value from Uncertainty and Flexibility</b>	AGM
SPEAKER	Reidar B. Bratvold (SPE DL)	
LOCATION		
SPONSOR	Chevron	
<b>June</b>	<b>MAIN SPEAKER</b>	<b>AFTER DINNER</b>
TOPIC	<b>SPE Summer party</b>	
SPEAKER		
LOCATION		
SPONSOR	Schlumberger	

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# WORKING WITH SAFETY – THE SAFE WAY CONDUCT

By Finn Primdahl Brodersen, Executive QHSE & Regulatory Affairs Advisor, and Jacob Heinrich Jensen, Head of QHSE, DONG Oil & Gas.

**We all wish to have work places free of any personnel accidents and injuries in our Oil & Gas business. We have had a continuous focus on safety in decades and as our overall safety statistics demonstrates, we have had success.**

However, how do we get to zero personnel incidents at our work sites? For years, we have asked ourselves that question and tried to answer. All safety professionals remember their CEO's asking about how to achieve zero lost time accidents. Unfortunately, there is not one simple answer to this question. It is a matter of hard work and constant focus on all the elements and situations, which occur in the work processes we perform, both in the office and offshore. It is a matter of having the right people with the right mind-set throughout the organization and an in-depth understanding of how to handle risks, which either can be planned for or which suddenly occur because of changes in the work situation.

For years, we have conducted safety training in risk understanding and exercised this in HAZOP and HAZID studies, Safe Job Analysis, Tool Box Talk's as well as safety talks and walks. We have talked about Safety Culture and about climbing the Safety Culture ladder to an even higher level of safety maturity. Further, when accidents unfortunately do occur a lot of work has been put into improving our procedures, which gradually has resulted in more and more comprehensive management systems making it increasingly difficult for the personnel on the job to embrace and follow. But at least something has been done to ensure that this particular incident will not happen again. We all can agree that procedures are needed, but they have limitations. Simply spoken, it is impossible to have a management system, which will cover all thinkable future incidents. This leaves us with a challenge but also leads us to the direction of the single individual working at our work places. What if this single individual to a certain degree could "make his or hers own mental procedures and handle the risks" in situations not covered by the various risk tools applied? – or at least safely stop the ongoing job. What if we

could have such a mind-set truly embedded in all of us, including our contractors – and at all times?

So understanding the need for each individual to have the right mind-set and focus on risk should be the guidance in the safety work going forward. The safety culture plays an important role in this context. When we talk about safety culture, it is often difficult to precisely state, what we really mean. Generally, we miss the glue which can combine our initiatives and the building blocks, which together forms the safety culture. Further we are missing a common language, which gives us the mutual understanding of what we want to achieve and perceive in relation to good safety culture. It can be difficult for the individual to understand exactly what is expected in relation to safe behavior and risk handling, particularly when working for different operators, which often is the case for our contractors.

In DONG Oil & Gas we have been working with our safety culture for many years, and in 2012 we gave it a name; "Safe Way Conduct". The basic idea was to "build the safety culture", making it easy to understand, what safety is about and where the various elements in good safety behavior is transparent. Further, we wanted to introduce a common and generic safety language. We call it the Safe Way Conduct House, founded on the more stringent management system (Figure). So the house is about "safety mind-set and driving the safety culture", whereas the foundation is related to the traditional rule based management. The Safe Way Conduct House consists of three levels beyond the foundation, where the central elements are the three Safe Way Controls and the five Safe Way Drivers:

- The Safe Way Controls are focusing on risk management in all phases of a job or project.
- The Safe Way Drivers deal with the safety mind-set and drive the ongoing effort to improve safety behavior and support the safety culture.

Finally, the roof of the house ensures that living the Safe Way Conduct is embraced within relevant HR processes.

A description of the individual drivers and controls was initially carried out but has been revised during the years





Safe Way Conduct has provided us with a common understanding of how we want the safety culture to be in DONG Oil & Gas. We have created a common language, which enable us to communicate clearly and precisely in any given situation. Furthermore, Safe Way Conduct has given each and every one a “license to operate” on a day to day basic, which is commonly accepted also in relation to more difficult personal related issues. The workshop implementation method has enabled us to reach out to each individual in the organization and we have experienced that these workshops act as eye-openers for the participants. With Safe Way Conduct we have taken the first and vital step to ensure that each individual understands what is expected of them in terms of safety behavior. But most importantly, since the Safe Way Conduct journey started in 2012, DONG Oil & Gas has managed to improve the safety performance significantly, coming from a LTI frequency at 5 in 2012 to a level around 1 to-day. Safe Way Conduct is not the only reason to this step change in safety performance, but the program has been and will continuously be the overarching and supporting factor that combined with other safety instruments as e.g. the safe job planning tools and safety leadership standards, has contributed to the positive results.

in order to be more and more sharp on the meaning and differences of each of the drivers and controls. The beauty of this system is that it is very simple, alive and easy to understand.

With the implementation of Safe Way Conduct in 2013 it was clear that this should not just be yet another campaign, but instead an ongoing program continuously being kept alive and lived within the organization. The introduction of the Safe Way Conduct program was carried out department wise starting with the offshore and more operational departments. Today we have introduced the Safe Way Conduct throughout DONG Oil & Gas in Denmark, Norway and UK embracing all departments, including staff functions as Finance and Procurement. Internal workshops with partition of some 8-20 persons in each session have been arranged and conducted by internal QHSE personnel thereby exposing principally all employees. Further our main contractors have been actively involved in meetings and workshops at their own offices with their own personnel.



The Safe Way Conduct House

# ABSTRACT

## A SUCCESSFUL HEJRE DRILLING CAMPAIGN – HOW TO PLAN YOUR LUCK & IMPROVE – AS A HABIT

The “Hejre”, High-Pressure High-Temperature Development Project is the first of its kind in the Danish North Sea and as such a project of highly complexity. The project was sanctioned together with the partner, Bayern Gas Norge.

Following the learnings from the 1st well, a constant learning process was established, which led to a transparent performance driven culture amongst all personnel involved i.e. offshore at the rig-site and also in the office. Together with the Rig Contractor and the main Service Contractor, it was crucial to establish aligned goals and targets to drive continuous performance improvement whilst maintaining the primary focus on Safety Performance. A culture of: “how can we do even better?” developed.

To highlight one major milestone, the 4th well was drilled and completed as the 4th longest/deepest HPHT development in the world with a final well depth of 6.625 km. ◀

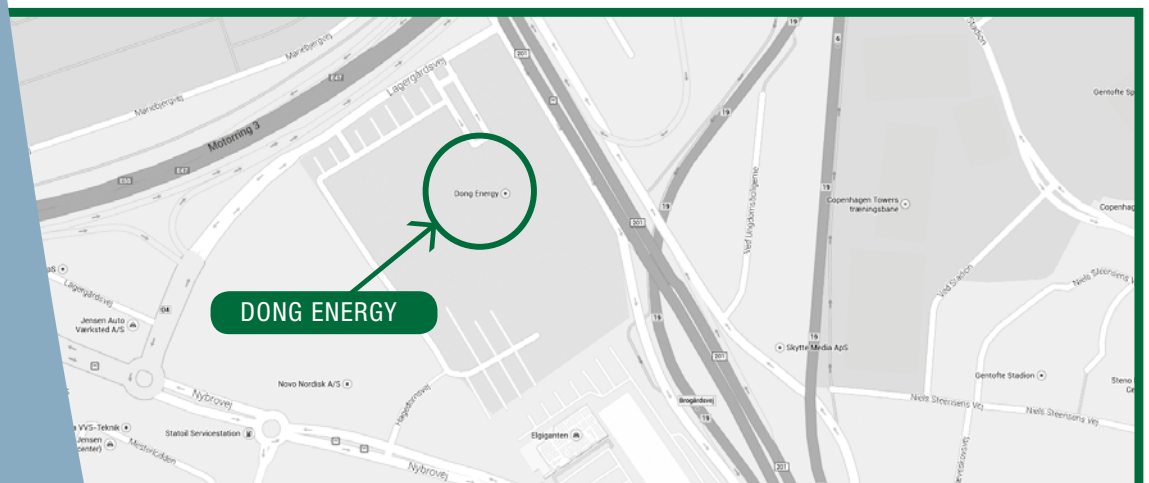


## BIOGRAPHY



**Peter V. Balslev, DONG**

Peter V. Balslev holds a MSc in Chemical Engineering from the Technical University of Denmark (DTU). He has 20 years of diverse experience within various drilling disciplines from the Danish North Sea and the UK North Sea and also from his 6 years in the Middle East. Peter joined Dong Energy in September 2014 in the role as the Hejre Well Delivery Manager to take on the overall responsibility of the drilling execution. ◀



# ABSTRACT

## HOW CAN COMPUTATIONAL FLUID DYNAMICS IMPROVE RESERVOIR SIMULATIONS AND COMPLETION STRATEGIES?

One of the great challenges facing our industry is the understanding of the well flow and its interaction with the reservoir. Conventional methods are too simple and imprecise for which reason the industry is now increasingly moving towards more advanced methods such as Computational Fluid Dynamics (CFD). CFD is widely used in many industries as a design analysis tool with a high level of success.

Lloyd's Register has recently made groundbreaking discoveries within analysis of horizontal well completion designs. These findings enable increases in well productivity and injectivity as well as facilitate improvements in well clean-up. The exciting new findings document the benefit of near-well CFD models compared to conventional reservoir model representations.

With the Joint Industry Project (JIP) Optimizing Oil Production by Novel Technology Integration (OPTION) we are combining reservoir modeling, CFD and PVT simulations together with uncertainty estimation into a new class of practical tools for predicting and performing optimum control of the flow between the horizontal wells and the reservoir in North Sea fields. The JIP partners are: Lloyd's Register, Welltec, DONG Energy, Technical University of Denmark and Copenhagen University. ◀

## BIOGRAPHY



### Kenny Krogh Nielsen

Kenny Krogh Nielsen holds M.Sc. and Ph.D. degrees in mechanical engineering within fluid dynamics and CFD. He has studied at Aalborg University and Teaxs A&M University. He also holds a Post Graduate Diploma from the von Karman Institute for Fluid Dynamics.

Kenny is senior principal consultant and team leader in fluid dynamics at Lloyd's Register and has been in-depth involved in well and reservoir modelling. Kenny is chairman of the steering committee of OPTION JIP. ◀



### Casper Schytte Hemmingsen

Casper Schytte Hemmingsen has a background from DTU and holds B.Sc. and M.Sc. degrees in mechanical engineering within numerical and experimentally fluid dynamics.

He is currently enrolled at DTU as a Ph.D. student within the OPTION project, where his research focuses on numerical subsurface modeling of the near-well region using CFD. ◀

C O P E N H A G E N  
M E E T I N G  
T U E S D A Y 1 4 M A R C H 2 0 1 7

11

MARCH

### PROGRAMME

17:00 - 18:00  
DRINKS

18:00 - 19:00  
PRESENTATION AND  
SPE NEWS

19:00 - 21:00  
TAPAS

LOCATION  
DONG E&P  
2820 Gentofte

### SPEAKER

Peter V. Balslev, DONG

### TOPIC

A Successful Hejre Drilling Campaign  
– How to plan your Luck & Improve – as  
a Habit

### AFTER DINNER SPEAKERS

Kenny Krogh Nielsen, Lloyd's Register,  
and  
Casper Schytte Hemmingsen, DTU

### TOPIC

How Can Computational Fluid  
Dynamics Improve Reservoir  
Simulations and Completion  
Strategies?

### ENTRANCE FEE

None

### REGISTRATION

Please indicate your attendance by  
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