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SOCIETY OF PETROLEUM ENGINEERS

SPE NEWS

COPENHAGEN SECTION

CONTENT

WELCOME TO THE NEW 2013-2014 SPE COPENHAGEN SEASON

A warm welcome to the SPE Copenhagen 2013-2014 season, both for new members and for all those who have been with the Society of Petroleum Engineers throughout the years. I hope you've all had a chance to enjoy a lovely Danish summer and are sufficiently energised to tackle what's next.

It's a challenging time for the oil business and the SPE as we continue to grow and adapt to a changing energy landscape. In response to this the SPE has released a new strategic framework in March this year. The Society has been successful in growing its membership base internationally, but certain aspects require special attention if we want to succeed in SPE's mission to 'efficiently collect and exchange technical knowledge and provide opportunities for professionals to enhance their technical and professional competence'.

In recent years international growth in SPE membership has mainly been from young professionals and students. While it is very encouraging to see this influx of young people there are a number of strategic initiatives to help the SPE ensure that technical quality is maintained, such as increased focus on cooperation with University Faculty staff, and implementation of more efficient knowledge sharing approaches.

An example of a strategic initiative where these concerns and opportunities are coming together is the PetroWiki platform. Just like the better known Wikipedia, success for PetroWiki will rely on volunteers, dialogue, enthusiasm, trust, and a great deal of academic input. PetroWiki implementation may be a good indicator of where our industry is heading in the long term and might become a testbed for increased collaboration between the industry and universities. Current efforts by the industry to fund university research and provide opportunities for experienced professionals to teach could be complemented by volunteer efforts of students and academics, as well as other SPE members, to contribute to PetroWiki by sorting through vast quantities of available SPE content, identifying material of greatest value or relevance and making it available to all. A process such as Wikipedia's 'collaborative editing' could enhance PetroWiki quality and contribute to the SPE's aim to be a trusted source of unbiased information.

I encourage everyone to take a look at the new and comprehensive SPE strategic plan, which covers many more aspects and is available here: **www.spe.org/about/docs/strategicplan.pdf**

Let's all have another great SPE season !

Hans Horikx,
SPE Copenhagen
Section Chairman

FUTURE MEETINGS

FOR MORE INFORMATION REGARDING THE PROGRAMME SEE PAGE 6

SPE

COPENHAGEN SECTION

THE BOARD · 2013-2014 SEASON

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PEARL GTL

The Pearl Gas to Liquids (GTL) Project, a joint venture of Shell and Qatar Petroleum, is the world's largest GTL plant and one of the largest, most complex and challenging energy projects ever commissioned. From the origins of Shell GTL technology nearly 40 years ago, to its first commercial debut in Shell's Bintulu GTL plant in Malaysia in the early 1990s, to the creation of the world's GTL capital in Qatar today – the delivery of GTL on a scale as vast as Pearl GTL has brought together almost every aspect of Shell's technical and project management capabilities.

Pearl GTL is a fully integrated upstream-downstream development capturing in one project the full gas value chain. From offshore development through onshore gas processing, the conversion of gas to hydrocarbon liquids, and the refining to finished products. Up to 1.6 billion cubic feet per day of wellhead gas from 22 offshore wells is converted to GTL using Shell's proprietary Shell Middle Distillate Synthesis (SMDS) process, built on 3,500 patents. From this, a range of high-performing GTL products is created. From gasoil, kerosene and base oil to naphtha and normal paraffins for the petrochemicals industry.

GTL products represent a pioneering innovation to increase supply of highly-demanded liquid hydrocarbons. Pearl GTL products are virtually sulphur free and have practically no contaminants such as heavy metals or aromatics. Their paraffinic chemical nature ensures that they are highly biodegradable and almost odourless. GTL Gasoil used in automotive applications such as buses can help improve local air quality, such as soot (particulates) emissions, when compared to use of conventional diesel fuel.

Shell's established global logistical hubs allow a high degree of flexibility in product placement, be it through blending the product into refinery streams, optimizing blends using traded supply or direct sales of GTL fuels to customers.

When it comes to illustrating the enormous scale of the project to build the world's largest GTL plant in Qatar, the statistics paint an impressive picture. Some 2 million tonnes of freight was shipped into a dedicated berth at Ras Laffan port adjacent to the plant site. More than 750,000 cubic metres of concrete was poured during construction. And enough steel was being used during the peak construction period to erect the equivalent of 2.5 Eiffel Towers a month.

The Pearl GTL plant has 24 reactors, weighing 1,200 tonnes a piece. They each contain 29,000 tubes full of Shell's cobalt synthesis catalyst, which speeds up the chemical reaction. If placed end to end, the tubes would stretch from Doha to Tokyo, while the combined surface area of the catalyst is almost 18 times the size of Qatar. The catalyst comes in the form of pellets that are as small as grains of rice. The vast surface area is due to the catalyst's many nano-sized inner channels, which make it highly porous so that huge volumes of gas can be exposed to the catalysts' chemically treated surface, accelerating the speed of reaction.

Construction at the Pearl GTL project, Qatar, 2010.

Pearl GTL required technical innovation in engineering design developments, procurement, contracting, logistics, construction, contractor interface management, safety management, manpower resourcing, and other key aspects of the project implementation. Examples of innovation include: the application of 2nd generation Fischer Tropsch synthesis catalyst with conditions adopted to fully benefit from its production capacity potential; integrated water management scheme for re-use of treated process water as boiler feed water and cooling water make-up, eliminating the intake of fresh water; advanced construction management practices overseeing a workforce of 52,000 at peak; logistics modelling to manage 2 million tons of freight resulting in no accidents; and the largest process automation system ever built in the energy industry.

Pearl GTL includes a number of technological novelties and innovations offshore. Using a system called Simultaneous Operations (SIMOPS), Shell achieved some of the shortest String Time per Well times ever recorded in the North Field. Twenty-two wells were completed on an average of 45 days, the fastest one in just 28 days, saving a total of more than 600 day's drilling time. Offshore operations also introduced the first application in the Gulf of a Platform Intervention Vessel using Dynamic Positioning in combination with a Heave Compensated Gangway. This enabled easy and safe access of personnel to the platforms for maintenance operations without need for helicopters.

Construction of Pearl GTL was completed on schedule with the complex starting up end of Q1 2011. Full ramp-up was achieved towards the end of 2012. The project was delivered on budget at around $18-19 billion. Despite massive number of workers involved and the complexity of Pearl GTL's construction, a strong safety culture helped Qatar and Shell break industry records. In 2010, the project achieved 77 million hours worked without a single lost time injury (LTI) and an overall LTI frequency of 0.04 LTI/million man-hours corresponding to about 1/10th of the industry average.

Pearl GTL's record breaking safety performance has been recognised both in Qatar and the region. In May 2011, the project was given the Gold Award at the inaugural Qatar Oil and Gas Industry Safety Awards event. In October 2012, the project won the ADIPEC Regional Award for best HSE in projects. Pearl GTL also set new standards with the creation of Pearl Village, a radically superior approach to contractor accommodation emphasizing worker welfare and specialized training to help drive safety, productivity and quality.

GTL technology provides an alternative route for natural gas monetisation, offering full upside to higher oil prices. Over the lifetime of the project, Pearl GTL will process about 3 billion barrels of oil equivalent of gas. For Shell's major resource holder customer, the State of Qatar, Pearl GTL has allowed for gas diversification while opening up new markets and opportunities – it's transforming decades' worth of gas reserves into economic progress, built on Shell's pioneering innovations.

Pearl GTL is truly a ground-breaking project leveraging one of Shell's key strengths: bringing innovative solutions to the energy challenge. ◄

ABSTRACT

NEW LENS SCENARIOS

Shell has been a pioneer in developing scenarios to explore the future and deepen their strategic thinking for 40 years. Shell leaders and decision-makers are the primary audience for the scenarios, but Shell has been sharing summaries with the outside world since the 1990s. The scenarios have since developed a global following, becoming a resource to governments, academics and think tanks around the world.

Shell scenarios contribute to the public dialogue on the collective challenges and choices we face as business, government and society. They also position Shell as a thought leader on the future of energy.

The "New Lens" Scenarios explore how economic, political and social forces might shape the global energy system and environment over the 21st century. As we consider two possible versions of the future, we apply "lenses" that help bring our volatile world into sharper focus.

Each scenario – Mountains and Oceans – dives into the implications for the pace of global economic development, the types of energy we use to power our lives and the growth in greenhouse gas emissions. ◄

BIOGRAPHY

Wim Thomas, Chief Energy Advisor, Shell

Wim is Chief Energy Advisor in Shell and heading the Energy Analysis Team in Shell's Global Scenario Group, which is part of the Corporate Strategy Department. He leads a team responsible for worldwide energy analyses and long-term global energy scenarios, and advises Shell companies on a wide range of energy issues, including global supply and demand, regulations, energy policy, markets, pricing and industry structure.

He has been with the Shell group of companies for some 29 years, with prior positions in drilling operations, subsurface reservoir management, and commercial and regulatory affairs in gas.

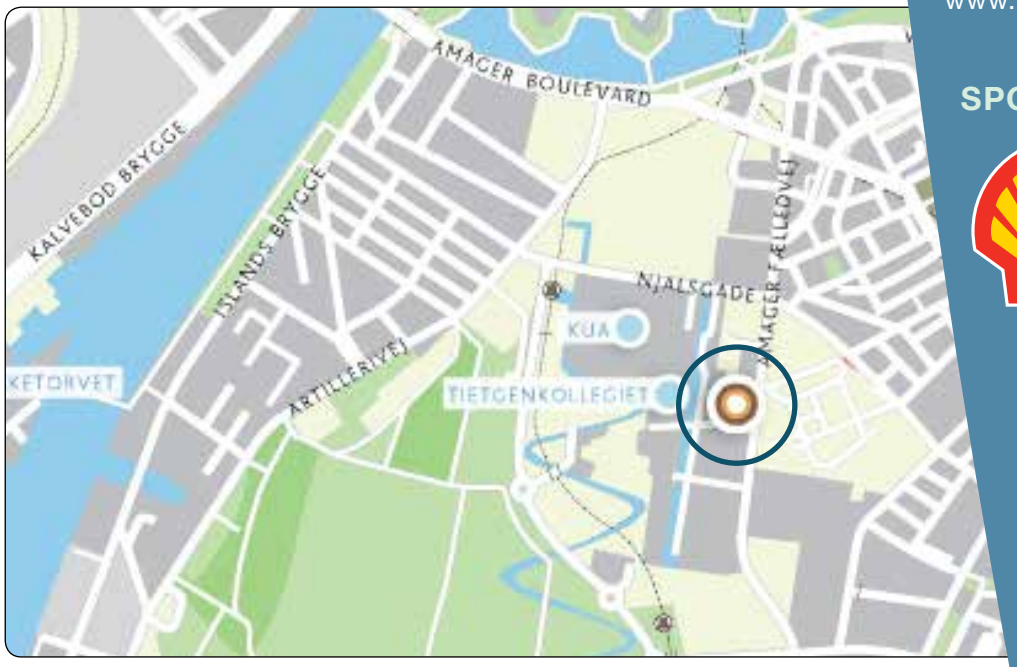
Wim is a UK member to the World Petroleum Council and advises the World Energy Council's energy scenario workstream. He is a former chairman of the British Institute of Energy Economics. He holds a postgraduate degree in Maritime Technology, Delft University, The Netherlands. ◄

ABSTRACT

DENMARK;
Fossil free in 2050?

Katherine Richardson is professor of biological oceanography and leader of Sustainability Science Centre, University of Copenhagen. She chaired the Danish Commission on Climate Change Policy, which presented a road map in 2010 for how Denmark can become independent of fossil fuels by 2050. She is lead author of the book Climate Change: Global Risks, Challenges and Decisions (2011). She was vice president of the European Science Foundation from 2001 to 2008 and is a principle investigator at the Center for Macroecology, Evolution and Climate. Ms. Richardson's speech will focus on the arguments for there being planetary boundaries within which societal development can take place and present Denmark's national goal of removing fossil fuels from its energy and transport sectors by 2050 within this context. ◄

Professor Katherine Richardson,
Leader of the Sustainability Science Center,
University of Copenhagen ◄



COPENHAGEN MEETING
MONDAY 16 SEPTEMBER 2013

SEPTEMBER

PROGRAMME
17:00 - 18:00
Drinks

18:00 - 19:00
Presentation and SPE News

19:00 - 21:00
Dinner

LOCATION
Mikado House
Rued Langgaards Vej 6-8
DK-2300 København S

SPEAKER
Wim Thomas,
Chief Energy Advisor, Shell

TOPIC
New Lens Scenarios

DINNER SPEAKER
Prof. Katherine Richardson
University of Copenhagen

TOPIC
Denmark; Fossil free in 2050?

ENTRANCE FEE
None

REGISTRATION
Please indicate your attendance by Wednesday 11 September by signing up on the internet www.spe-cph.cere.dk

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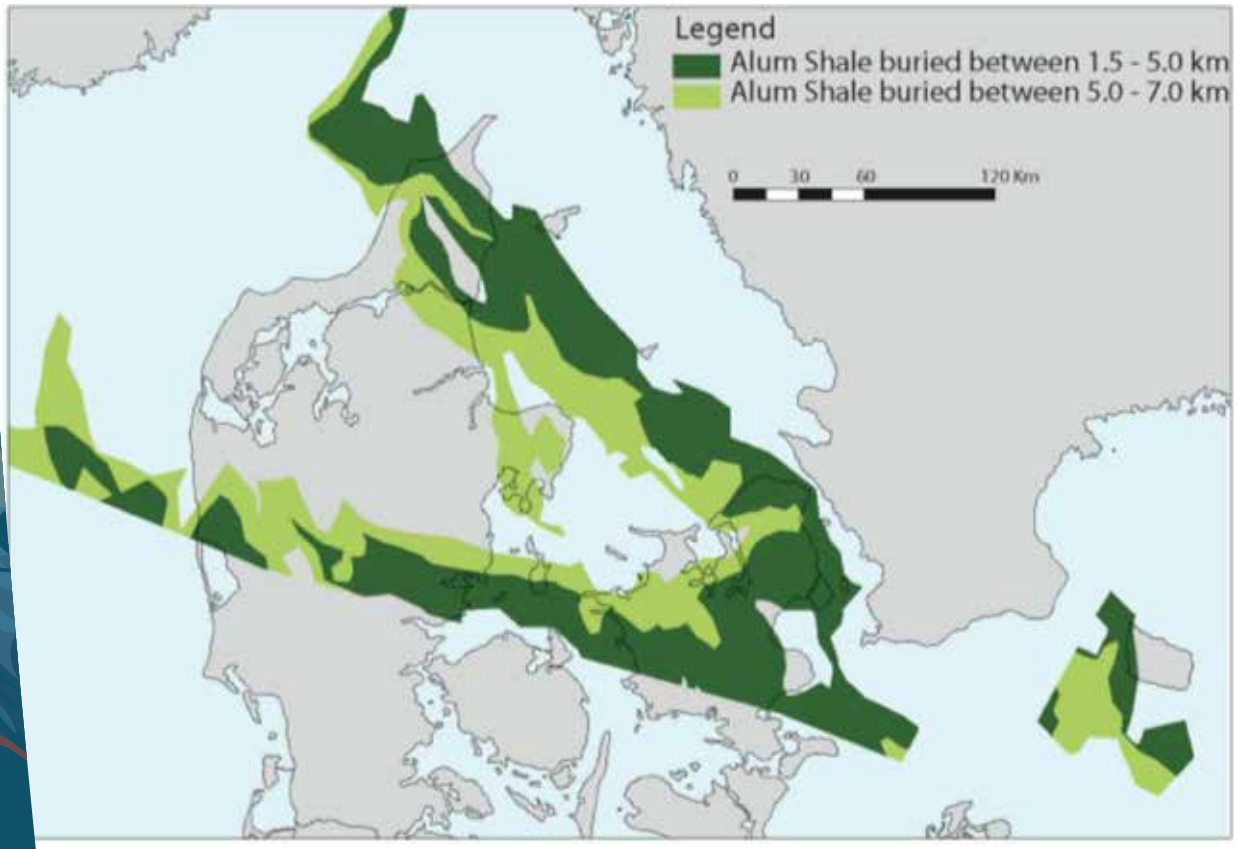
www.spe.org

SPE MEETING SCHEDULE 2013-2014

September 16	MAIN SPEAKER	AFTER DINNER
TOPIC	**New Lens Scenarios**	Denmark; Fossil free in 2050? Prof. Katherine Richardson, Univ. of Copenhagen
SPEAKER	Wim Thomas, Chief Energy Advisor, Shell	
LOCATION	Shell Mikado House	
SPONSOR	SHELL	
October 28	**MAIN SPEAKER**	**AFTER DINNER**
TOPIC	**Fluid Profiling - A Modern Technique for Reservoir Characterization**	
SPEAKER	Michael O'Keefe - SPE DL (Schlumberger)	
LOCATION	GEUS	
SPONSOR	GEUS	
November	**MAIN SPEAKER**	**AFTER DINNER**
TOPIC	**TBA**	
SPEAKER		
LOCATION	DTU	
SPONSOR	DTU	
January 27	**MAIN SPEAKER**	**AFTER DINNER**
TOPIC	**Hydraulic Fracturing Myths, Reality and Environmental Stewardship through Better Chemistry**	
SPEAKER	Daniel J. Daulton - SPE DL (Baker Hughes)	
LOCATION		
SPONSOR	Chevron	
February 19	**MAIN SPEAKER**	**AFTER DINNER**
TOPIC	**Development of Mature Oil Fields: Enhanced Oil Recovery Option**	
SPEAKER	Tayfun Babadagli - SPE DL (University of Alberta)	
LOCATION		
SPONSOR	Welltec	
March	**MAIN SPEAKER**	**AFTER DINNER**
TOPIC	**TBA**	
SPEAKER		
LOCATION	Maersk	
SPONSOR	Maersk	
April	**MAIN SPEAKER**	**AFTER DINNER**
TOPIC	**South Arne Development - Hess**	
SPEAKER		
LOCATION		
SPONSOR	Hess	
May	**MAIN SPEAKER**	**AFTER DINNER**
TOPIC	**TBA**	Annual General Meeting
SPEAKER		
LOCATION	DONG	
SPONSOR	DONG	
June	**MAIN SPEAKER**	**AFTER DINNER**
TOPIC	**SPE Summerparty**	
SPEAKER		
LOCATION		
SPONSOR	Schlumberger	

THE DANISH SHALE GAS



Map showing the Alum Shale prospective area in Denmark. The overlying Ordovician and Silurian shales are buried but a few hundred metres less. The mapping is part of the assessment of the shale gas resource which is expected to be finalized in late 2013. Lower Palaeozoic shales are also present in the centre of the Norwegian-Danish basin, but they are too deeply buried to be of interest for shale gas exploration.

European shale gas exploration is still in its early phase. In many countries the oil and gas industry has focused on thick organic rich Palaeozoic shales known as important source rocks for conventional oil and gas fields. In Denmark shale gas research and exploration is also focused on the Lower Palaeozoic shales and two licences have been awarded to Total E&P. The first exploration well for shale gas is scheduled to be drilled in northern Jutland mid-2014.

GEUS and the University of Copenhagen has since 2009 conducted a wide range of shale gas evaluation projects including shallow coring in areas where the shales are accessible immediately beneath a thin Quaternary cover. Key questions have been: maturity and basin development, gas storage capacity, TOC and mineralogy and how they shales will respond to hydraulic fracturing.

In Denmark the potential unconventional resources in the Lower Palaeozoic occur along the margin of the Norwegian-Danish Basin where the Palaeozoic shales are buried between 1.5-7 km. The onshore prospective area for Palaeozoic shales is estimated at about 13 000 Km2. Within the Lower Palaeozoic sequence the primary target formation is the Cambro-Ordovician Alum Shale which is unusually rich in organic matter, typically 5-10% and locally up to 20% (in central Sweden immature Alum Shale even contains 25% TOC). The formation is up to 180 m thick in offshore areas. Organic rich shale intervals also occur in the slightly younger Ordovician and Silurian successions. These black shale units are thinner than the Alum Shale, max. 15 m, and contain less organic matter, up to 5%, but they are still interesting for shale gas exploration.

The Alum Shale is absent in most of Poland and in this respect the Danish shale gas play differs from Poland. The Polish shale gas play involves the same Ordovician and Silurian shales as present in Denmark.

PLAY

The Lower Palaeozoic shales in Denmark were buried and matured to gas stage within a Caledonian foreland basin during the late Silurian-early Devonian time. In the Carboniferous and early Permian the Palaeozoic succession was faulted, tilted and subjected to intensive erosion. Local intrusions also occur. Because of the complicated burial history it is currently uncertain whether significant amounts of gas still are trapped in the shales. The gas may have leaked out through millions of years of uplift and progressive erosion since the gas formed more than 400 million years ago. A study conducted by Shell on the Alum Shale in southern Sweden indicated that the formation now located at 700-800 m depth does not contain gas in economical quantities and gas retention in the shale poses a major risk factor for the Danish shale gas play.

GEUS is currently leading a joint study between the geological surveys of Denmark, Sweden, Lithuania, Estonia and Poland on the geological development of the Lower Palaeozoic Baltic Basin. The outcome of the study will form the basis for an assessment of hydrocarbon potential in the Baltic Basin made in corporation with the US Geological Survey. ◄

Core photo of the Alum Shale in the Billegrav-2 well, Bornholm. The Alum Shale on Bornholm is c. 30 m thick and GEUS and the University of Copenhagen have drilled 4 shallow wells on the island within the last 3 years. The wells, which also penetrate Ordovician and Silurian shales, have provided new stratigraphical knowledge and fresh core material for geochemical studies.

Niels Schovsbo,
Senior Reservoir Geologist /Geochemist, GEUS Copenhagen

Niels Schovsbo is GEUS Coordinator for shale gas investigations. He is a scientific partner on the Gas Shales in Europe (GASH) research project and an EAGE 2011-12 Shale gas student lecture. He has more than 10 years' experience with low permeable shale and chalk reservoirs, 9 of which he has been with GEUS. Current research interests include thermal maturity indices, chemostratigraphy and reconstruction of the black shale and chalk depositional environment and reservoir properties of shale and chalk reservoirs. He received his Ph.D. (2001) and M.Sc. (1995) degrees in geochemistry from the University of Copenhagen.

Arne Thorshøj Nielsen,
Associate professor, dr.scient, University of Copenhagen

Arne T. Nielsen has been working on the Lower Palaeozoic of Baltoscandia and elsewhere for more than 25 yrs, focussing on sea-level changes, sequence stratigraphy, biostratigraphy, palaeoecology and reconstruction of the depositional environment. The Alum Shale of Scandinavia has been in focus for more than 10 yrs. Current research interests include sequence stratigraphy and sea level reconstruction in the later part of the Cambrian. He received his M.Sc. in 1985 and his D.Sc. in 1995 from the University of Copenhagen.

ABSTRACT

FLUID PROFILING
A Modern Technique for Reservoir Characterization

Over the years, oil companies have started recognizing that a disturbing number of reservoir- and production- management problems could be traced back to a single root cause – inadequate understanding of reservoir fluid properties. As we strive to complete more complex reservoirs, we are challenged to better understand the nature of the fluids contained within. Classical "black oils" are still encountered; however it is not uncommon to find scenarios where volatile fluids that exhibit a bubble point in close proximity to fluids with dew points. Heavy oils can also display a high degree of compositional grading with wide variation of viscosity through the reservoir, which directly affects productivity. In addition, knowing the CO_2 & Sulfides content together with formation water pH is critical for completions and facility design.

Characterizing these fluids is challenging. Typically wireline formation testers with fluid analyzers are used for early fluid characterization and sampling. However, with the increasing fluid complexity subtle differences need to be understood. This requires comprehensive compositional analysis, high resolution answers and quantified accuracy. Undetected flow barriers in the reservoir may lead to disappointing production results. Equilibrated pressure over geologic time does not guarantee flow communication during the production time. A deep understanding of the chemical and physical fluid properties of reservoir fluids is paramount.

Traditional approaches to downhole fluid sampling have in many cases failed to provide sufficient resolution for the variation of fluid properties in the reservoir. An integrated approach using the latest technology helps to overcome the discrepancies. Modern wireline formation testers now provide an arsenal of sensors to accurately measure the reservoir fluid downhole at reservoir conditions. Contemporary workflows utilize these measurements for real-time downhole fluid analysis, which enables the data acquisition program to be optimized to the actual fluid column in place. Fluid complexities can be determined at a very early stage in the exploration/appraisal phase, which leads to a more economical Field Development Plan. ◄

BIOGRAPHY

Michael O'Keefe, GEUS (Maersk Oil from May 2013)

Michael O'Keefe is Principal Reservoir Engineer for Schlumberger, based in London where he is involved in exploration and appraisal projects across Africa and Europe. Previously he was the Product Champion for Downhole Fluid Analysis where he managed the technology portfolio of new fluid sensors in development. Michael joined Schlumberger in 1990 as a field engineer and has worked in the North Sea, Europe, Saudi Arabia, Africa and Australia.

Author of 20 technical papers (six of which have been peer-reviewed in SPE Journal of Reservoir Evaluation and Engineering), numerous industry articles, and 7 granted patents, As a member of the Quicksilver Probe development team Michael recieved the Hart's Meritorious Engineering Award at the Offshore Technology Conference in 2006. ◄

SPE SUMMER PARTY

AT LANGELINIE PAVILLONEN

A canal tour is often a fine occasion to learn something about a city, but participants of the tour that opened the SPE summer party rapidly began to ignore many of the tourist trivia as the first champagne bottles were being opened, courtesy of sponsor Schlumberger. And then with Christiania and the little mermaid behind them, the sight of Langelinie Pavillonen and the prospect of more formal welcome drinks and a fine dinner were greeted with joy by many of the men and women in black tie and stylish long dress.

The view from Pavillonen of the sun slowly setting over the Kastellet fort was a wonderful backdrop for the evening, which continued with an enjoyable three-course dinner and a speech by the chairman. Anticipation grew as the night progressed on what the traditional surprise entertainment was going to be. It turned out to be an expert entertainer that made us question our own senses. Showman and hypnotist Henrik Svanekiær dazzled everyone with a combination of comedy, unexpected turns and unfathomable illusions. And he had some nice card tricks too ! It is fair to say that no one left the room unaffected after his entertaining performance.

It was a truly memorable event in the rich tradition of SPE summer parties. ◄

COPENHAGEN
MEETING
MONDAY 28 OCTOBER 2013

OCTOBER

PROGRAMME
17:00 - 18:00
Drinks

18:00 - 19:00
Presentation and SPE News

19:00 - 21:00
Dinner

LOCATION
GEUS
Øster Voldgade 10
1350 København K

SPEAKER
Michael O'Keefe
SPE DL

TOPIC
Fluid Profiling - A Modern Technique for Reservoir Characterization

ENTRANCE FEE
None

REGISTRATION
Please indicate your attendance by Wednesday 23 October by signing up on the internet www.spe-cph.cere.dk

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