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WELCOME TO THE NEW 2018-2019 SPE COPENHAGEN SEASON

Dear SPE Copenhagen existing and new members, welcome to the 2018-2019 SPE Copenhagen Season after such a great Danish summer. I have the great honor of writing my first page on the SPE Copenhagen Newsletter and I would like to thank outgoing Board members for their dedication to the SPE Copenhagen section: Anders Norman from who I am picking up the baton as chairman of the SPE Copenhagen Board, Claus Myllerup (DHRTC), Duncan Healey (Chevron) and student rep Leonardo Meireles (DTU). We warmly welcome a new SPE board member: Mette Lind Fürstnow (Welltec), Jose Antonio Perez-Acero (DTI) and Hadise Baghooee (DTU).

Let me share an area of concern: SPE Copenhagen section membership numbers are falling. I want to take this opportunity to remind you about the great benefits of the SPE membership: it provides access to many tools and resources, such as world class technical publications, webinars, online articles and courses, all free and available at spe.org.

On the positive side, we have in front of us a very good line-up of SPE events throughout the year, with a mixture of SPE Distinguished Lecturers and Company presentations, excellent events for networking opportunities and knowledge sharing. The season started in September with the DTI event at DTU and continues

in October at GEUS where Paul Mitchell (SPE Distinguish lecturer) will be talking about 4D Seismic History Matching.

I am happy to announce that the SPE Copenhagen Section is going digital with the creation of the LinkedIn account (<https://www.linkedin.com/company/spe-copenhagen-section/>) which will be used as a platform to provide information related to events and other relevant topics for our section. Watch out that space!

As the Greek philosopher Heraclitus once said, 'The only thing that is constant is Change', which we will all agree summarizes what the Danish oil and gas industry has experienced over the last year. Historical players like Maersk Oil left the business after being acquired by Total; DONG Energy, another historical player, was acquired by INEOS; Hess communicated the intention to sell their interests in Denmark, and Total recently announced it was acquiring Chevron's share in the DUC.

And talking about things being unpredictable, let's take a look at the oil price: when the famous 'lower for longer' was widely accepted by everyone, seems like we are back to the 80's... let's see for how long.

Looking forward to seeing all of you at the October SPE Copenhagen event at GEUS. ◀

Jaime Casaus-Bribian
SPE Copenhagen
Section Chairman

FUTURE MEETINGS

FOR MORE INFORMATION REGARDING THE PROGRAMME SEE PAGE 6

SPE

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THE BOARD · 2018-2019 SEASON

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GEUS SERVICES RELEVANT TO GEO THERMAL AND OIL – From microscale to macroscale



GEUS provides access to all publically available data from the Danish area. In addition, GEUS is fully equipped with state-of-the-art laboratories and modelling software to provide full cycle research based G&G services to the oil and gas industry - from exploration to field optimisation.

Laboratory for Organic Geochemistry and Petrology can provide source rock screening, maceral composition, vitrinite reflectance for thermal maturity and detailed biomarker analysis by GC-MS/MS.

Biostratigraphic analysis is performed routinely on borehole and outcrop samples. Fossil groups include eg. foraminifera, diatoms, nannoplankton, dinoflagellate cysts and spores and pollen as well as ammonites and belemnites.

Besides conventional poro/perme analyses the **Core Analysis Laboratory** performs flooding experiments at reservoir conditions with pressure and temperature up to 690 bar and 150° C, respectively. A hand held Niton™ XL3t Gold+ XRF device can provide rapid chemical screening of samples, core or outcrop for rock typing or first level chemostratigraphy and diagenetic indications.

Petrophysical Formation Evaluation and permeability models are provided with use of Software packages like StratWorks & PetroWorks, DecisionSpace, Techlog and Petrel.

Core and cutting samples are used to analyse **diagenesis and provenance**. Mineral quantification by point counting and SEM Mineralscan. U/Pb age dating by LA-ICP-MS of heavy minerals for source area fingerprinting, optionally accompanied with more elaborate element analyses.

Core descriptions of carbonates and siliciclastic deposits with special expertise on chalk, sandstone and mudstones. Facies analysis, including ichnology, interpretation of depositional environment, and identification of key sequence stratigraphic surfaces (SB, FS, MFS etc.).

VANT FOR L & GAS ACTIVITIES cale



Reservoir modelling and flow simulation is performed using Petrel and Eclipse software packages. Incorporation of structural architecture in geological models is used for analysis of lateral connectivity and for evaluation of potential vertical flow pathways through faults and fracture corridors.

GEUS provides access to all core material from the Danish area and offers the possibility to inspect cores from deep wells in the Danish territory at our **Corestore** equipped with display facilities.

Seismic equipment, processing and interpretation expertise for shallow seismic studies (2D/3D seismic), normal reflection seismic work and deep crustal studies even for ice-covered operations. Post-Stack spectral whitening to improve seismic vertical resolution by whitening the frequency. Inversion of seismic data into acoustic impedance and porosity, and forward modelling.

Field trips and training classes in Denmark, Greenland and Europe. Field analogues; from small to seismic scale analogues. Examples of topics: Chalk as a reservoir, and various clastic depositional environments. ◀

Regional studies related to industry.

PETSYS - The Jurassic Petroleum System in the Danish Central Graben.

Consistent and complete data package with stratigraphic overview correlated to interpreted seismic horizons. The study presents an overview of reservoir characteristics and outline the regional source rocks/petroleum characteristics of the Jurassic in the Danish Central Graben.

CRETSYS - The Cretaceous Petroleum System in the Danish Central Graben

Key aspects of the Cretaceous prospectivity are still to be developed due to the stratigraphic and structural complexity of the Cretaceous sedimentary system. The study presents a consistent regional framework based on an integration of seismic, stratigraphic/biostratigraphic and petrophysical data for the Danish Central Graben.

CENSYS - Cenozoic Petroleum System in the Danish North Sea

The increased interest for hydrocarbon exploration in the younger Cenozoic (post Chalk) succession demands a new consistent regional model. The study integrates a 2D based seismic study with released 3D seismic data, new biostratigraphic analysis and petrophysics of selected key wells. The study provides 18 maps, a new lithostratigraphic subdivision and a palaeo-environmental reconstruction.

NAG-TEC - Tectonostratigraphic atlas of the northeast Atlantic region

A comprehensive, new atlas of the North Atlantic conjugate margins between Greenland and Europe, including geophysical data, crustal and structural information, and the stratigraphic development of the region.





ABSTRACT

4D SEISMIC HISTORY MATCHING

This presentation will show how time-lapse or 4D seismic data can be used as an additional constraint to history match reservoir models in a 4D Seismic History Matching (4D SHM) workflow. 4D seismic provides an independently measured and spatially extensive dataset that complements the field's production data.

It is sensitive to fluid saturation and pressure changes and provides information on the dynamic behavior of the reservoirs. It is also sensitive to the geological properties and informs the geological model too. 4D SHM is the process of developing reservoir models that are consistent with both the observed production data and the 4D seismic data. When 4D seismic data are available the reservoir model can be used to generate synthetic 4D data. Discrepancies between those two datasets are used to update the models and to attain a seismic history matched simulation model. A case study will be presented where 4D SHM was applied to the Harding and Gryphon fields in the North Sea. It was used to develop regional geological and simulation models for a major gas development project. The combination of geological knowledge, reservoir simulation and 4D SHM led to greater confidence in the final models. 4D SHM is an evolving technology, so the presentation will conclude with a discussion on the current status of the technology and some of its research and development directions. ◀

BIOGRAPHY



Paul Mitchell
TAQA Bratani Ltd.

Paul Mitchell is the Discipline Lead for Geophysics at TAQA in the UK. He has broad ranging responsibilities and is a technical authority for geophysics within the company. Paul has thirty years of experience in exploration, development and production geophysics from around the world. He spent a number of years working in ExxonMobil's Upstream Research Center in Houston specializing in seismic depth imaging, 3D volume interpretation and 4D seismic.

He is currently working within a multi-disciplinary team developing subsurface models for a large gas development project in the North Sea. His current interests are in 4D seismic and its application to 4D Seismic History Matching and he has presented his work at numerous international conferences. He holds a B.Sc. in Physics from the University of Southampton and a M.Sc. in Exploration Geophysics from Imperial College in London. He is the Founding President of the EAGE Local Chapter in Aberdeen and is Chair of the SPE Seismic2018 conference. ◀



OCTOBER

PROGRAMME

17:00 - 18:00
DRINKS

18:00 - 19:00
PRESENTATION AND SPE NEWS

19:00 - 21:00
DINNER

LOCATION

GEUS
Østervoldgade 10
1350 København K

SPEAKERS

Paul Mitchell
SPE DL Taqa

TOPIC

4D Seismic History Matching

ENTRANCE FEE

None

REGISTRATION

Please indicate your attendance by Thursday 25 October by signing up on the internet www.spe-cph.dk

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SPE MEETING SCHEDULE
2018-2019

September	MAIN SPEAKER	AFTER DINNER
TOPIC	Tracer Technologies in Reservoir Management	
SPEAKER	Troels Nielsen (DTI)	
LOCATION	DTU	
SPONSOR	SPE	
October 29	MAIN SPEAKER	AFTER DINNER
TOPIC	4D Seismic History Matching	
SPEAKER	Paul Mitchell (SPE DL, Taqa)	
LOCATION	GEUS	
SPONSOR	GEUS	
November	MAIN SPEAKER	AFTER DINNER
TOPIC	Natural Surfactants in Oil Production Smart Waterflooding: How It Works?	Things No One Tells About Fossil Fuels
SPEAKER	Simon Ivar Andersen (DHRTC) - DTU Alexander Shapiro, CERE - DTU	Hans Horikx (DHRTC) - DTU
LOCATION	DTU	
SPONSOR	DTU	
January	MAIN SPEAKER	AFTER DINNER
TOPIC		
SPEAKER		
LOCATION	Total	
SPONSOR	Total	
February 5	MAIN SPEAKER	AFTER DINNER
TOPIC	Drilling Automation and Downhole Monitoring with Physics-based Models	
SPEAKER	John Hedengren (SPE DL)	
LOCATION	Hess	
SPONSOR	Hess	
March	MAIN SPEAKER	AFTER DINNER
TOPIC		
SPEAKER		
LOCATION	Welltec	
SPONSOR	Welltec	
April 9	MAIN SPEAKER	AFTER DINNER
TOPIC	Managing Non-Technical Risks Made Practical and Value-driven	
SPEAKER	Christiaan Luca (SPE DL)	
LOCATION		
SPONSOR		
May	MAIN SPEAKER	AFTER DINNER
TOPIC	Energy Transition	
SPEAKER	Lee Hodder, VP Denmark Shell	
LOCATION	TBA	
SPONSOR	Shell	
June	MAIN SPEAKER	AFTER DINNER
TOPIC	SPE Summer party	
SPEAKER		
LOCATION		
SPONSOR	Schlumberger	

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DENMARK FACTS

\$1 Billion <small>INVESTED TO EXTEND PRODUCTIVE LIFE OF THE SOUTH ARNE FIELD</small>	14,000 <small>(BOE/D) NET PRODUCTION</small>	5th <small>LARGEST PRODUCER IN DENMARK</small>	7% <small>OF DENMARK'S PRODUCTION</small>
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The SPE Copenhagen Chapter, DTI Oil & Gas, Tracer Technologies, and Microbial Management

On the 25th of September, DTI Oil & Gas and the SPE Copenhagen Chapter merged forces as tracers and microbial challenges were discussed. An event that aimed managed to bridge the academia and Danish Oil & Gas Industry.

The Technical University of Denmark (DTU) constituted the setting of the first SPE Copenhagen meeting in the 2018/2019 season. As the campus of DTU welcomed the members of the SPE Copenhagen Chapter, the comfortable atmosphere allowed participants to catch up and discuss ongoing work and projects, as well as everyday-life situations. However, with a schedule ranging from 05.00 p.m. to 08.30 p.m., the technical presentations by Troels Bach Nielsen (DTI Oil & Gas) and Steffen Larsen Aggerholm (DTI Oil & Gas) were of primary focus.

The main speaker of the meeting was Troels whose presentation revolved the “Application of Tracer Technologies in Pursuance of Informed Reservoir Management Decisions.”

Afterwards, Steffen grabbed the mic and presented his view on “Microbial Challenges and Upside of Efficient Management in Oil & Gas Installations.”

Troels and Steffen – Who are They?

Both Troels and Steffen carry out their everyday activity in DTI Oil & Gas’ offices at DTI Oil & Gas division in Aarhus, under the umbrella of Teknologisk Institut -an institution founded in 1906 with the purpose of helping the Danish Industry, which has evolved to a worldwide technical consulting firm.

Troels holds a master’s degree in chemical engineering from Aalborg University (M.Sc. Chem. Eng). At DTI Oil & Gas, he works as a section manager where his primary focus is within the fields of tracer studies, conformance treatments, contract R&D and EOR technologies, including microbial EOR. Working as a section manager, Troels is involved in staff- and business-development, laboratory- and fieldwork as well as data interpretation and reporting.

Speaking about the “Application of Tracer Technologies in Pursuance of Informed Reservoir Management Decisions”, Troels presented the properties of a variety of tracers and how they are best used in different contexts. Especially the isotope tracer, Deuterium Oxide, and its usefulness for interwell tracer studies, subsequent fracture characterization, and conformance treatments played a central role in his presentation.



Troels Nielsen presenting at the SPE Copenhagen Chapter monthly event.



Steffen presenting at the SPE Copenhagen Chapter monthly event.

Steffen holds a Ph.D. in Microbiology from Aarhus University. Working as a consultant at DTI Oil & Gas, he aids operators in gaining insights into their microbial challenges and develop solutions that tap into their needs. Steffen has a background working with soil, seawater, wastewater, and applying advanced molecular and microscopy techniques (on a single cell basis).

Speaking about “Microbial Challenges and Upside of Efficient Management in Oil & Gas Installations”, the focal points of Steffen’s presentation were microbial corrosion and the operational implications that arise due to the presence of microbial hotspots. Monitoring, risk assessment, and mitigation activities were key takeaways.

Broadening the horizons

Both Troels’ and Steffen’s presentations generated interesting questions from the SPE members. Because of that, the nominated time for the presentations was slightly pushed aside as the number of productive and insightful discussions intensified. All of which broadened the horizon of DTI Oil & Gas as well as the ones of the SPE members. Therefore, it is without a doubt that the meeting on the 25th of September acted as a catalyst for bridging the academic institutions and the Danish Oil & Gas main operators.

Afterwards, the catching up among SPE colleagues and the discussions from the presentations continued over a friendly and tasteful dinner. A dinner that was organized in collaboration with the enthusiastic members of the SPE DTU Student Chapter, and with the sponsor of the SPE Copenhagen Chapter.

DTI Oil & Gas thanks all the attendees and organizers for a great event.





ABSTRACT

Natural surfactants in oil production

Simon Ivar Andersen
Advisor,
Center for Oil and Gas (DHRTC) - DTU

Interfacial tension plays an important role in reservoir mechanisms and in the production and processing of crude oil with coproduced water. Natural surfactants adhere to the oil/water (O/W) interface, which reduces the interfacial tension and in some cases leads to solidified interfacial film with a significant impact on emulsion stability. These technical challenges are a result of the chemistry of the petroleum system and hence optimization of production depends on a better understanding of this. The properties and composition of the interfacial film have been the subject of many studies, but few have studied the competition of different species at the interface and the impact on properties. This presentation will summarize observations from work the presenter was involved in comprising understanding the competition between asphaltenes and carboxylic acids at interfaces, the impact on the interfacial film properties, the modeling of dynamic interfacial tension and how this impact the production. Further we look into the dramatic effects that the design of interfacial tensions studies may have on the results as we have found that results are significantly different when doing the classical oil-in-water drop analysis vs the water-in-oil droplet. One component of this can be the effects of bulk depletion by interfacial adsorption which is significant at low concentrations and small droplet sizes. We ended up with the question of what is actually the appropriate interfacial tension to be used in modeling.

The presentation covers published research partially in collaboration with Saudi Aramco from the author's time at Schlumberger Research. ◀

SPE Presentation at DTU Introduction Week

On August 29, 2018, during DTU introduction week, a brief introductory presentation about SPE Student Chapter's activities was given for new master students at DTU.

The emphasis of the presentation was mainly on SPE as a non-profit organization that is not only for Petroleum Engineers but also for students of other majors who are interested in working in different sectors of oil and gas industry. During this pitch, other benefits of SPE such as scholarships, connections to professionals from different disciplines, future career possibilities were also highlighted. ◀



Smart waterflooding: How it works?

Alexander A. Shapiro
Associate Professor,
Center for Energy Resources Engineering (CERE) - DTU

Waterflooding is a recovery method, with which around 50 per cent of the world oil is produced. It started almost ninety years ago; however, only recently it has been recognized that changing the salinity and salt composition of the injected water may increase the recovery. "Smart waterflooding" is a collective name for the methods of improved oil recovery based on modification of the salinity and salt ion composition of the injected brine.

For waterflooding in the sandstone reservoirs, dilution of the injected brine was found to be effective. The physico-chemical mechanisms behind low salinity flooding in sandstones are more or less well understood. Meanwhile, smart waterflooding in carbonate reservoirs remains a mystery. Specific salts (or ions), temperature, and other conditions have to be carefully selected for a particular rock, in order to achieve improvement in the recovery. Literature mentions many different mechanisms, which might be responsible for the effect of smart waterflooding: these are wettability alteration, surface chemical reactions, double layer expansion, precipitation and dissolution, rock weakening and compaction, fines migration, emulsification, and other.

The goal of this presentation is to summarize recent advances in understanding of the smart waterflooding. This understanding is necessary in order to cook an optimal injection brine and predict the results of the recovery. The presentation is largely based on the results obtained at the Center for Energy Resources Engineering (CERE-DTU), in the framework of the ADORE, SmartWater, and BioRec projects. The newest studies have been carried out in close collaboration with the Center for Oil and Gas (DHRTC-DTU). ◀

Things no one tells you about fossil fuels

Hans Horikx
Advisor, Center for Oil and Gas (DHRTC) - DTU

Abstract: A light hearted account of everything you always wanted to know about fuel but were afraid to ask. This is a talk you'll want to hear if you ever asked yourself questions such as: If oil is made of animal remains, why can humans not digest it? How does oil make us fly? Or: Who determines what the fuel of the future is?

Presenter: Hans Horikx is currently adviser at the Danish Hydrocarbon Research and Technology Center, having previously worked at Maersk Oil and Shell in 9 countries on 5 different continents. His background is mainly in Subsurface aspects of E&P across the entire maturation cycle, from Exploration and Appraisal to Development, Field Operations, Acquisition & Divestment and Field Abandonment. He has worked in a number of disciplines including Production Technology, Petrophysics and Reservoir Engineering. His latest role in Maersk Oil was as corporate Chief Reservoir Engineer. ◀

PROGRAMME

17:00 - 18:00
DRINKS AND POSTER SESSION

18:00 - 19:00
PRESENTATION AND SPE NEWS

19:00 - 21:00
DINNER

LOCATION

DTU b. 101
Auditorium S09
and DTU Faculty Club (dinner)
Anker Engelundsvej 1
2800 Kgs. Lyngby

SPEAKERS

Simon Ivar Andersen (DHRTC)
Alexander Shapiro, CERE

TOPIC

Natural Surfactants in Oil Production
Smart Waterflooding: How It Works?

DINNER SPEAKER

Hans Horikx, DHRTC

TOPIC

Things No One Tells About Fossil Fuels

ENTRANCE FEE

None

REGISTRATION

Please indicate your attendance by Wednesday 15 November by signing up on the internet www.spe-cph.dk

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The Danish Hydrocarbon Research and Technology Centre look forward to welcoming everyone at the annual technology conference on the **12th and 13th of November 2018** at Crown Plaza Copenhagen Towers.

Find the full programme and sign up at www.oilgas.dtu.dk

