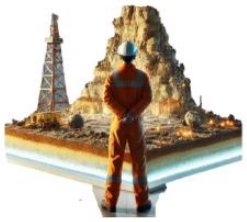

The Future of Formation Evaluation

Seminar

Date: Thursday December 5th 2024

Location: Virtual (Teams)

Start	End	Duration		Presentation title	Presenter	Company
14:00	14:15	0:15		**Introduction by SPWLA France President**	Emmanuel Caroli	TotalEnergies
14:15	14:45	0:30		**Keynote speech** / Métaux, le nouvel or noir	Benjamin Louvet	OFI Invest
14:45	15:15	0:30		Sustainable Lithium Production – From Pore-to-Product	Sharad Dubey	SLB Critical Minerals Global BDM
15:15	15:45	0:30		Reservoir Fluid Properties From Cuttings: An Innovative Synergy of Gel Permeation Chromatography and Data Analytics	Alexandra Cely	Equinor ASA
15:45	15:55	0:10		**Break**		
15:55	16:10	0:15		SPWLA France news		
16:10	16:40	0:30		Obtaining Remaining Oil Saturation For The Johan Sverdrup Field From a Variety of Logging Data	Brice Fortier	Equinor ASA
16:40	17:10	0:30		Wellbore Evaluation for Well Decommissioning	Pierre CHUILON	TotalEnergies
17:10	17:15	0:05		**Closing remarks**	Emmanuel Caroli	TotalEnergies

KEYNOTE SPEECH: MÉTAUX, LE NOUVEL OR NOIR

Benjamin Louvet, OFI Invest

ABSTRACT

This is probably the greatest challenge that humanity has ever had to face: we have 30 years to replace oil, coal and gas with renewable energies, wind and photovoltaic in particular.

But we cannot produce electricity with only wind and sun! And the construction of transformers, wind turbines or solar panels depends on an essential raw material: metals. Our dependence on fossil fuels will therefore turn into a dependence on metals. And we are not ready! Politically, geopolitically, industrially, changes are necessary so that metals do not become the forgotten ones of the energy transition... and the source of insurmountable difficulties in the future. What metals are essential to this transition? Will we have enough? Can mining production keep up with the necessary pace? Have the political powers taken the measure of this challenge? What can be the place of Europe in this upheaval? How can we align the perspectives of investors, industrialists and politicians with this new need? Can recycling save us? This book offers a dive into the world of critical metallic raw materials, and explores the constraints and the responses needed to make the energy transition essential to the survival of our societies possible.

BIO

Benjamin LOUVET is an asset manager at Ofi Invest AM (Raw Materials Management director), specialized in raw materials for over twenty years. Trainer, speaker on energy transition topics, he regularly speaks on the topic of metals and energy in the media.

SUSTAINABLE LITHIUM PRODUCTION – FROM PORE-TO-PRODUCT

Sharad Dubey, SLB

ABSTRACT

Electric vehicles continue to follow the S-curve of technology adoption. This has spurred the accelerating demand for lithium ions batteries and the concomitant need for the efficient and sustainable extraction of more lithium salts. Current extraction and recovery practices are prone to inefficiencies, tremendous resource consumption, environmental degradation, and reliance on a few specific geographies. To alleviate the pending supply chain shortages, geopolitical concerns, and environmental harm, direct lithium extraction (DLE) is being championed as the preferred method to efficiently recovery lithium from salt-lakes, oilfield brines, geothermal brines, and seawater. In a DLE operation, the lithium bearing brine is exposed to conditions that selectively remove lithium ions from the brine followed by the reinjection of lithium free brine and conversion of lithium ions to value added lithium salts.

Ensuring the rapid and successful implementation of new sustainable extraction techniques in the lithium space will require more than standalone DLE operations – the transition will require the integration of the best technologies from across energy and water treatment sectors. A holistic project-based approach, which spans the domains from pore to product. Complementing the technologies, the flowsheet, requires dedicated and sensitive online sensors leveraging expertise for modeling of new processes, data analytics and automation controls to optimize and run operations safely and efficiently from a central command & control center. There is a critical effort underway to optimize and digitally integrate

subsurface models, at the pore level, to project surface feed compositions over several decades, and to accurately simulate the reinjection of spent brine, further emphasizing the sustainability character of DLE processes into the water balance of aquifers.
This presentation will highlight the commissioning and operation of SLBs integrated demonstration plant in Clayton Valley, NV. This is one of the largest demonstration DLE operation in the world and includes an integrated approach to extraction from subsurface exploration, lithium extraction, purification, concentration, and conversion. The paper discusses the benefits of taking an integrated approach to sustainable DLE Lithium production, and details the methodology for de-risking the scale up of complex lithium projects, in an integrated manner.

BIO

Sharad has been with SLB for more than 27 years, experiencing the rich diversity of SLB culture and technology in multiple countries with assignments across Wireline, Integrated Project Management, Oilfield Services and now Critical Minerals under SLB New Energy. In his current role, Sharad focuses on the go-to-market strategy of various products and services including lithium subsurface modelling, early engineering solutions of a Lithium project capital life cycle, piloting and projects, and collaborative business models for an entirely new customer base spread across different regions.

RESERVOIR FLUID PROPERTIES FROM CUTTINGS: AN INNOVATIVE SYNERGY OF GEL PERMEATION CHROMATOGRAPHY AND DATA ANALYTICS

Alexandra Cely, Equinor ASA

ABSTRACT

Drilling cuttings, often deployed for lithology and mineralogy analyses, hold untapped potential. Extracts from cuttings are valuable in traditional geochemical analysis, particularly in water-based mud applications. On the other hand, the scarcity of reservoir fluid samples from reservoir zones and overburden presents a challenge, withholding vital insights crucial for well integrity, plugging and abandonment (P&A), and efficient reservoir management and production. Paradoxically, numerous drill-cutting samples remain unexamined within storage facilities. We have achieved a significant milestone after an intensive two-year research effort focused on developing an innovative Gel Permeation Chromatography (GPC) technique for analyzing reservoir oils and cutting extracts. Our innovation facilitates the in-depth examination of reservoir fluid properties, i.e., API gravity and viscosity, from oils and cutting samples, effectively overcoming challenges associated with oil-based mud contamination. In this study, we investigate the application of GPC coupled with both Ultraviolet (UV) and refractive index (RI) detectors to generate multi-detector spectra from reservoir fluids and cuttings extracts originating from six distinct fields situated in the Norwegian Continental Shelf (NCS). The technique is deployed to analyze oil samples, encompassing a wide range of reservoir fluid types, including condensates, volatile oils, black oils, and heavy oils. The primary goal of the study is to estimate reservoir oil density using GPC-UV-RI spectra from cuttings. Following acquiring GPC spectra, the data is compiled into a vectorized dataset for subsequent processing in a data analytics workflow. This data processing phase comprises exploratory data analysis and quality checking, data augmentation, and machine learning modeling that serves as a proof-of-concept of the application. A suite of machine learning algorithms, including regularized linear regression models, are evaluated, and a comprehensive comparison of performance, generalization capability, and robustness of the baseline and augmented models are also discussed.

The developed models demonstrate robust accuracy in predicting reservoir fluid properties, specifically °API (American Petroleum Institute gravity). Fundamentally, this technology has large potential to transform each drill-cutting fragment into a PVT (Pressure-Volume-Temperature) sample and contributes significantly to unlocking the latent value within the cuttings, which are readily available and offer access to reservoir fluid properties at an early stage in field development, including the drilling phase. The application of the technology is not only cost-effective but also carries far-reaching implications that extend into various areas, such as strategic well placement, enhanced wellbore integrity, and optimized completion strategies. This innovation marks a significant step towards maximizing value creation in exploration and production operations.

BIO

Alexandra Cely is a principal reservoir engineer at Equinor that holds a master's degree in Env. offshore engineering with a chemistry major from the University of Stavanger. She started in Equinor in 2012 as a flow assurance engineer working in field development projects and joined the PVT and fluid analysis group in 2019. Alexandra is the leading researcher on the fluid property prediction from cuttings project and is currently responsible for the thermodynamic correction of the standard mud gas data. Besides oil and gas, Alexandra is active in the low carbon solutions, especially on hydrogen value chain

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OBTAINING REMAINING OIL SATURATION FOR THE JOHAN SVERDRUP FIELD FROM A VARIETY OF LOGGING DATA

Brice Fortier, Equinor ASA

ABSTRACT

The Johan Sverdrup field situated on the Norwegian Continental Shelf (NCS) stands as the third largest oil field on the NCS. Given the reservoir's proximity to hydrostatic pressure, maintaining a constant production pressure hinges on the concept of voidage replacement. The drainage strategy is sea and produced water reinjection and , in a subsequent phase, Water Alternating Gas (WAG) injection. The reservoir has excellent reservoir properties: average 26% porosity and multiDarcy permeability. The ambition is to recover more than 70% of hydrocarbon in place, therefore a comprehensive data acquisition strategy is in place to unravel and optimize reservoir drainage. Dedicated to water flooding monitoring, an observation well plays a crucial role in this strategy. Drilling the well at the right time, a full suite of open hole logs has been acquired to fully characterize formation and fluids. The well has been completed with a non-perforated cemented liner. Pulsed neutron logging is conducted every 3 months to monitor waterfront evolution and evaluate in-situ Water Saturation (Sw). Logging results allow to evaluate the waterfront evolution pace while also confirming that water flooding primarily occurs laterally along most permeable layers These observations are used or planned to be used in the reservoir- and petro-elastic models to validate their overall accuracy. Notably, the pulsed neutron-derived water saturation within the flooded zone currently deviates from the estimated residual oil saturation obtained from open hole saturation evaluation and core experiments. To address this discrepancy, a comprehensive investigation has been undertaken, utilizing a multitude of data sources, including advanced NMR techniques, verified by laboratory measurements. This investigation reveals that residual of drilling oilbased mud, relatively deep into the borehole wall, may still influence pulsed neutron several years after drilling. It is believed that future well log acquisitions will contribute significantly to our understanding of this phenomenon

BIO

Brice Fortier is discipline leader for petrophysics for Johan Sverdrup and Martin Linge fields in Equinor, based in Stavanger, Norway. After graduating in 2005 from Ecole de Geologie de Nancy with a master degree of geology engineering and in 2006 from IFP-School in Paris as petroleum geologist, he joined Schlumberger wireline in Luanda, Angola as field engineer, then Data and Consulting Services as borehole geologist in Aberdeen, Scotland and Stavanger in Norway. In 2011 he joined Statoil, as asset petrophysicist. for Fram and Vega fields then Johan Sverdrup field since 2014. He is also leading the image-log competence group for Equinor and is involved in the creation of customized internal applications to optimize petrophysics workflows

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WELLBORE EVALUATION FOR WELL DECOMMISSIONING

Pierre Chuilon. TotalEnergies

ABSTRACT

The presentation will discuss the evaluation of wellbore cementation for well decommissioning. It highlights the technical and financial stakes for TotalEnergies and the oil industry. Various methods and technologies are mentioned for evaluating cementation, including low-frequency probes (CBL/VDL) and high-frequency ultrasonic probes (USIT, Iso Scanner). The document also covers casing integrity, annulus geometry, and the use of very high-frequency ultrasonic probes (Cereus) for pipeline inspections. Other techniques such as nuclear and electromagnetic probes are also discussed. The importance of multi-physics to solve complex problems and reduce false positives/negatives is emphasized. Finally, the document concludes with the necessity of having a common test/benchmark/reference site, specifically the U7 well of Norce.

BIO

Pierre Chuilon is a Formation Evaluation Senior Specialist at TotalEnergies. He began his career in the oil industry in 1985 with a service company. In 1990, he joined Total and worked as a geologist at the Pau Scientific Center, Paris HQ, and various affiliates. He's graduated from IFP School in 1997 with a degree in exploration geology. Since 2004, Pierre has focused on formation evaluation and logging topics. From 2012 to 2015, he led the Total Alternative Logging Evolutions project, and from 2015 to 2021, he served as the technical manager of the Total E&P ASD logging calibration facility in Artigueloutan, France. Currently, his main interests are cased hole logging and nuclear logging tool modeling.
