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Profitable & Sustainable Production Operations in Oil and Gas with Scalable Digital Transformation Roadmaps

Aarti Dange
Emerson

Abstract:
Digital transformation is evolving in different organizations at a different pace and may have a defined roadmap with emerging technologies. The implementation of these technologies should align with the defined key performance indicators to deliver the desired profitability. The opportunity areas for implementation are Production, Reliability, Safety and Emissions, which in turn contribute to operational excellence. By following the digital framework / ecosystem consisting of the foundation cornerstones – Sensing technologies, Secure Connectivity Infrastructure, Software Platforms and Cloud infrastructure, each organization can carve a niche to deliver benefits.
Right analytics and methodologies provide actionable insights for speedy actions. A hybrid approach of first principles driven with Artificial Intelligence and Machine Learning is becoming extremely popular to solve production and reliability challenges.
Two case studies are discussed herein. The first one is predicting ESP failures using hybrid approach in a thermal production environment. The case study details the approach and results of the project. The second study illustrates the Asset wide Gas Lift Optimization, combining the advanced process control and predictive analytics for the compressors with automated well test validation.
" There is no one Digitalization approach that fits all. Digitalization is a scalable approach and requires maturity assessment to identify the starting point. For successful digital transformation, people and processes are of paramount importance."

Biography:
Aarti Dange, an experienced upstream oil and gas professional, with 18 years of experience and currently holds a pivotal role at Emerson Automation Solutions, leading customer experience and advising on digital and sustainability solutions. As a petroleum engineer, she has worked in subsurface modeling, characterization, production, and well automation and analytics.
Aarti's primary focus lies in the digital transformation of upstream oil and gas, concentrating on well digitization, diagnostics, and predictive analytics, employing cutting-edge technologies like Artificial Intelligence and Machine Learning. In her capacity as a solutions architect, she tackles industry challenges with bespoke technological implementations.
As a notable industry influencer, Aarti has made substantial contributions through various publications and presentations at industry forums. A dedicated member of the Society of Petroleum Engineers (SPE) for two decades, she currently chairs the Data Science and Engineering Analytics technical committee for the Middle East and Africa.
Aarti's list of paper publications includes "Digital Solutions for Carbon Capture and Geosequestration, "Use of AI and Machine Learning for Asset level Gas Lift Optimization" presented at the SPE AI Symposium in 2023.and "Use of AI and Machine Learning for Asset-level Gas Lift Optimization" presented at the SPE AI Symposium in 2023. Her contributions also extend to Asset Integrity Digital Solutions, Wireless Realtime Corrosion Monitoring, and significant research on sand production and Sucker Rod Pump design modifications, showcasing her commitment to advancing the industry.

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Insightful Geomechanical Measurements for Converting Existing Hydrocarbon Reservoirs to Carbon Storage

J. Adam Donald
SLB

Abstract:

As the industry transitions from traditional hydrocarbon exploration and development into new energy and carbon capture and sequestration (CCS), formation integrity becomes more integral for asset longevity. For instance, many depleted fields are being assessed for CCS, but these depleted fields rarely have enough information within the overburden to assess geological seals or caprock integrity.

Geomechanics modeling with calibration data is required for determining the maximum injection pressure for containment for the carbon sequestration. Often the critical data were not gathered during the initial appraisal phases of these existing fields to perform the assessment with certainty. Three existing technologies can provide the geomechanical information needed for integrity assessment, namely compressional and shear slowness in cased hole, stress barrier limits, and natural fracture distribution.

First, full waveform sonic logs that provide compressional and shear slownesses (1/velocity) are generally acknowledged as the key data missing from the formation evaluation needed in for the geomechanics modeling. Cased boreholes within the overburden always were deemed unattractive environments for sonic measurements, and now these will be the main sources of information in aging assets. Second, when entering the reservoir, to determine the limit of the stress barrier (difference in stress between caprock and reservoir), stress magnitudes and orientation require an integration of sonic, borehole image, and minifrac testing. Maximizing the injection pressure without risking leakage is the goal for the asset performance. Third, assessment of natural fractures within the reservoir and evaluation of the caprock play an important role for maximum injectivity and for reducing leakage risks, respectively. Although borehole image log analysis has been around for decades, sonic imaging technology is now more commonly being used to assess the far field within tens of meters around the wellbore providing new insights.

This work explains how existing technology from traditional oil and gas can be used for CCS reservoir and overburden assessment. Specifically, three topics are covered: (1) sonic data analysis within single-and double-string casings; (2) integration of sonic, image, and minifrac analysis for stress characterization; and (3) natural fracture evaluation using far field sonic imaging. Case studies from reservoirs worldwide (Asia, Europe, Middle East, North America) serve as examples of using these insightful measurements.

Biography:

J. Adam Donald is the Technical Director for Geomechanics and Wellbore Acoustics with Reservoir Performance Division, SLB, based in Dubai, UAE. He joined SLB in 1998 as a wireline field engineer has held field, technical, and management positions in Canada, USA, Norway, Malaysia, France, Romania, and United Arab Emirates. His area of focus has been on applications of wellbore sonic and image data on geomechanics, geophysics, and petrophysics workflows. He received his bachelor's degree in geological engineering from University of Waterloo in Ontario, Canada (1998), and a master's degree in mining engineering from Dalhousie University in Nova Scotia, Canada (2004). Adam holds seven patents in areas of borehole acoustics and geomechanics and is a registered Professional Engineer in Canada. He is an active publishing member of SPWLA, SPE, ARMA, and SEG with over 50 industry and scientific articles.

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No Longer A Sunk Cost: Innovation & Collaboration For Decommissioning Subsea Infrastructure

Andrew Robson Watt
Woodside Energy

Abstract:

Decommissioning involves the timely, safe, and environmentally responsible removal, or satisfactorily dealing with, infrastructure from offshore oil and gas operations.

With a significant number of aging subsea assets, it's estimated the cost of decommissioning in Australia alone will exceed US$45 billion over the next 50 years.

Not unlike a Rubik's cube, decommissioning can seem like an unsolvable puzzle. Many sides must work together to solve a complex problem with a multitude of variables including environmental impact, safety, timing, and cost. Many decommissioned materials cannot be re-used and are not easily recycled. Collaboration and innovation are vital to help us find the right combination of solutions to achieve the best outcomes.

Universities play a crucial role in this process by providing access to cutting-edge research, knowledge, and resources. These collaborations can create an environment that fosters innovation, where academia and industry professionals can work together to share knowledge and expertise and explore new technologies and methodologies.

This lecture highlights the subsea oil and gas infrastructure decommissioning challenges we face as an industry, showcases some innovative solutions, and explains how in today's rapidly changing world, innovation and collaboration are essential for achieving success.

The key takeaway is that we must solve this puzzle together. By working collaboratively, we can create a more sustainable future, reduce costs, and achieve more efficient decommissioning.

Like solving a Rubik's cube, cooperation, collaboration, and innovation require patience and persistence, but the rewards can be great, and our subsea infrastructure will no longer be a sunk cost.

Biography:

Andy Watt is an energy industry professional with over 26 years of experience in various technical roles across Australasia, North Africa, the Middle East, and Indonesia. He has expertise in land seismic operations, geophysics, reservoir engineering, forecasting, production optimization, technology, and innovation.

Currently, Andy serves as the Innovation Advisor at Woodside Energy, Australia's largest oil and gas company. In this role, he collaborates with Australian universities and industries to develop and implement innovative technical solutions.

Andy holds a Bachelor of Science (BSc) in Applied Physics and Microelectronics and is an active member of the Society of Petroleum Engineers (SPE).

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Characterizing and Mitigating Drilling Dysfunction: High Frequency Torsional Oscillation (HFTO)

Ashley Johnson
SLB

Abstract:
HFTO is one of the more damaging dysfunctions for our drilling operations. With cracked collars, lost tools, mechanical and electrical damage the annual cost to the industry in damaged tools alone is many hundreds of millions of dollars. However, through subtle changes to the BHAs and drilling parameters we can mitigate the vibration and improve our system reliability. We show examples of this, how it is triggered, characterized and mitigated.
This dysfunction is similar to other torsional oscillations where the wavelength, frequency and node (no displacement) position are critical in their characteristics.
For HFTO, the node was always thought to be in the drilling motor where the torque coupling forms a reflector to torsional waves. However, we now show that the friction at formation touch points can also trigger a node.
For rotary steerable assemblies there are 2 families of HFTO. Type 1 where the node is in the drilling motor, and type 2 where the node is at a contact point with the formation. The latter having a shorter wavelength and higher frequency (150 – 400 Hz) than the motor driven dysfunctions (50 – 300 Hz).
These also differ in their triggers and mitigation. For Type 1, a step increase in WOB can trigger this vibration, while a slow increase in motor differential pressure can dampen and mitigate the dysfunction.
Type 2 is driven by the friction at contact points with the formation. An increase in tortuosity can trigger it. While increasing the collar speed can mitigate it. Reducing the friction at the contact point can mitigate the vibrations, we show cases where positioning wearbands at critical points can reduce the HFTO amplitude and improve system reliability.

Biography:
Ashley has worked for SLB for 35 years in R&E across up-stream domains from seismic air gun design through drilling, fluids and cementing to perforating, stimulation and abandonment.
Prior to joining SLB he gained a Bachelor's in engineering from University of Cambridge and a Doctorate from Oxford in experimental fluid mechanics.
He has been the principal developer for numerous services including the PURE perforating and Coiled Tubing Blaster systems.
Recently he was Research Director for Well Construction looking after the Drilling and Automation research portfolios for SLB. Currently he is the Science Advisor to Well Construction focused on Drilling Optimization, particularly mitigation of Shock and Vibration.
He holds 245 patents world-wide.

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A LEADERSHIP APPROACH TO MANAGEMENT

DR. BEHROOZ FATTAHI
THE ENERTRAIN INSTITUTE

Abstract:
This lecture offers a discussion of perceptions of management and leadership, and how the ability to manage is augmented through leadership. The talk is very beneficial for employees, employees who want to become managers, and current managers who wish to become the future effective leaders.

Although leadership training has become popular in recent years, it seems that lack of proper practice has diminished its impact on management effectiveness resulting in a persistent poor employee engagement at the workplace.

While managers plan, organize, and measure value, leader managers take the additional steps of inspiring, motivating, enabling, and adding value. It will be shown that the key to success for an organization is to transform its managers to leader managers through the ongoing process of soft competency learning followed by effective soft capable practicing. A new Leadership-Management model which offers a new leadership approach to management is introduced, and explained.

Biography:
Dr. Behrooz Fattahi holds Ph.D. degrees in Aerospace Engineering and in Mechanical Engineering from Iowa State University. After 37 years of working in the industry, he retired from Aera Energy LLC, an affiliate of Royal Dutch Shell and ExxonMobil companies in 2014.

He served as the Executive Editor of the SPE REEJ, President of SPE Americas, VP-Finance, and SPEI Foundation VP. He also served as a member of the US National Petroleum Council. He is the recipient of AIME/SPE's DeGolyer Medal for Distinguished Service, AIME's Presidential Citation, recognized AS SPEI's "Distinguished Member", "A Peer Apart," and elected as AIME/SPEI's "Honorary Member." He was a 2018-2019 SPEI "Distinguished Lecturer."

Dr. Fattahi was elected as the 2010 President of SPEI, and the 2014 President of the AIME. He is now the President of the EnerTrain Institute, providing petroleum heavy oil training and consulting as well as lectures, and workshops on soft competencies internationally.

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What does the energy transition actually mean for the Oil & Gas industry ?

Besmir Hoxha
Darcy Partners

Abstract:
What does energy transition mean? What are we transitioning to? How and when will we get there? In hindsight, the energy transition movement means different things to different entities. To operators, the primary focus is to transform their business (influenced by regulations and legislative policies) by reducing their carbon emissions while also investing in cleaner low-carbon energy sources, such as geothermal and hydrogen. For service companies, it is another potential revenue stream by offering products and services oil and gas operators, as well as renewable power generation companies. For governments, it is defined as an essential need for energy diversification in order to achieve sustainable, self-sufficient solutions that are less impacted by socio-economic or geo-political factors, i.e., energy security. It is important to note that the 'public' understand that what is driving this paradigm shift: technology, policy, and cultural change. The energy transition concept will be broken down as a current 'buzzword' and popular concept that is fettered by technology hype, political agendas, and/or financial influences that are attached to the term. Finally, light will be shined on how the industry's previous institutional mindset has changed to a broad, open-minded desire to create a net-postive outcome using Environmental, Social, and Governance techniques.

Biography:
Bez is an associate consultant at Darcy Partners, focused on market intelligence and management consulting for oil and gas operators. Bez has over 40 publications, 4 patents, 1 book, and 14 years of experience in the energy sector – hydrocarbons to renewables. Previously, Bez worked as an Energy Technologist at Baker Hughes, engaged on techno-commercial applications in energy transition projects. Additionally, he also has experience as Sr. Research Scientist in academia. Bez is active in SPE as a committee member for ATCE and ADIPEC. Bez has a master's degree in petroleum engineering and a PhD in Management in Energy Transition.

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Liability is for Ever: Risk Elements in the Implementation of Decommissioning and Well P&A

Dr Brian G Twomey
Reverse Engineering Services Ltd

Abstract:

Facility decommissioning together with well plugging and abandonment (P&A), collectively known as D&A, is a critical element of any oil and gas project life cycle. Often, it is an afterthought, barely considered at the outset, particularly when production sharing contracts are negotiated and signed. Despite this vital activity costing as much (or occasionally more) than the initial project development, it seldom receives similar critical, scoping and planning attention that construction and drilling activities need to attain final investment decisions (FID).

Frequently shunned due to costs and zero associated revenue, D&A remains largely misunderstood, neglected, or ignored during asset life. Experience illustrates that effective decommissioning must be planned years in advance of execution, ideally in parallel from the construction stage. Moreover, decommissioning should be managed as carefully as project development to mitigate looming liabilities for existing operators and future generations.

This lecture shares optimal learnings and critical project reflections from projects globally.

Biography:

Dr. Brian Twomey established Reverse Engineering Services Ltd (RESL) over 30 years ago; a specialist consultancy solely focused on the decommissioning, abandonment, and recycling of onshore and offshore facilities, pipelines, wells, subsea systems and ships. He has more recently leveraged that experience to incorporate lessons learned during decommissioning in the petroleum industry to new and emerging arenas, including the offshore wind and nuclear industries.

Brian has unique global expertise. He has decommissioned projects in every major petroleum province of the world, in many cases identifying unique innovative solutions. Additionally, Brian has helped formulate and shape national decommissioning policies and guidelines; he has assisted both regulators and operators in the optimal design and interpretation of national regulatory frameworks.

Brian is a leading authority in developing the next generation of competence to address the tsunami of complex decommissioning projects which are rapidly being imposed on an unsuspecting worldwide industry. Over the past 12 years, Brian has served as a global trainer on decommissioning with SPE International on several continents. He holds BSc, MSc and PhD, MSc in Mechanical Engineering, Composite Materials, Plant Design & Applied Mechanics respectively from University of Manchester Institute of Science and Technology (UMIST), UK.

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Geomechanical Risks Mitigation – A Must for Safe Long-Term CO2 Geological Storage

Tan Chee Phuat
PETRONAS

Abstract:
Carbon dioxide (CO2) capture and geological storage is the best alternative method of produced CO2 disposal instead of venting into the atmosphere. However, there are numerous geomechanical challenges and risks associated with CO2 injection and geological storage that are required to be addressed.
A comprehensive assessment of the geomechanical-related risks to ensure safe CO2 containment and leakage risk mitigation requires coupled geomechanics-dynamic-thermal modelling as part of feasibility evaluation of injecting and storing CO2 in a field. Changes in stresses, mechanical and petrophysical properties based on laboratory CO2-rock interaction test data and deformation state of the rocks are computed by the geomechanical simulator using data from the reservoir simulator which include changes in pressure, CO2 concentration within plume, water saturation and temperature.
The presentation covers the key geomechanical mechanisms associated with CO2 leakage risks and study workflow, and follow by coupled geomechanics-dynamic-thermal modelling assessment of risks associated with CO2-rock interaction, fault re-activation, caprock failure, injected CO2 cooling on caprock and reservoir, and breach of completions and well integrity. The assessments are illustrated through two CCS Storage Development Plan projects for which recommendations from geomechanical perspective were developed. One of the projects is sanctioned for Final Investment Decision with first CO2 injection in 2026.
The take-away insights are geomechanical risk mitigation is one of the key pillars in ensuring safe CO2 geological storage, and the information and workflow presented can be adopted for evaluation of CCS projects in hydrocarbon fields, saline aquifers and dry structures worldwide.

Biography:
Tan Chee Phuat, PhD has 37 years of petroleum geomechanics experience in R&D, technical service, operation and academic, and is Chief Scientist Geomechanics with PETRONAS Group Technology & Commercialisation. Prior to PETRONAS, he was Geomechanics Advisor at SLB and Senior Principal Research Scientist at CSIRO Petroleum, Australia. He is recipient of 2023 SPE Northern Asia Pacific (NAP) Regional Drilling Engineering Award and 2019 SPE NAP Regional Completions Optimization & Technology Award, and holds 3 patents, 9 trade-secrets and 4 copyrights. He authored/co-authored more than 230 technical publications and given more than 70 presentations at keynote addresses, forums, conferences and technical workshops. His education includes PhD (Rock Mechanics) from Monash University, Australia.

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ESG for Petroleum Engineers - Without the Hot Air
(What the International Capital Markets Expect from the Oil & Gas Industry)

Christiaan W.F. Luca
Community Wisdom Partners

Abstract:

Environmental, Social and Governance (ESG) continues to gain attention. Increasingly, ESG compliance is a condition for funding by shareholders and banks. Most recently, the European Union has started to turn ESG industry standards into regulation. Unfortunately, ESG has become clouded in an overload of jargon, requirements and metrics; in addition, it is now also becoming politicized.

This lecture shows that ESG has been developing since the start of the industrial revolution and is here to stay. It will identify key long term ESG trends and will use them to foresee what the future may bring.

The capital markets have converged on a handful of industry standards that are almost universally accepted and applied by all major financial organisations. These standards are risk- and value-based, and project-focused. As such they are a blessing in disguise: although elaborate and demanding, they provide a level playing field, and can be easily integrated in existing business processes.

ESG scrutiny is moving from auditing of policies and manuals to carrying out due diligence on actual implementation in the field. In other words, petroleum engineers, project and operations managers have become part of ESG compliance. This lecture will use case studies to highlight the essentials that they need to know.

Biography:

Christiaan Luca holds a MSc in petroleum engineering from Delft University, the Netherlands. The first part of his 32-year career with Shell he spent in various petroleum engineering roles, including drilling, reservoir engineering, project planning and economics, while developing oil and gas fields in Thailand, Syria, Gabon and Nigeria.

Upon returning to Shell's corporate offices in the Netherlands he held various management roles in technology and business strategy and planning. He was closely involved with externally-challenged programs in CCS and Rigs-to-Reefs. Until end 2016, Christiaan was the head of Shell's global practice in non-technical risk management. He now is an independent trainer, assessor and coach in this expertise area.

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InSAR for Asset Integrity: How Satellite Data Can Provide Critical Insights for Oil & Gas and CCUS

Courtney Lucente
TRE Altamira

Abstract:
InSAR (Interferometric Synthetic Aperture Radar) is a remote sensing technique which has been deployed for over 20 years to provide millimetric scale ground deformation measurements. In subsurface applications, InSAR data can highlight areas of ground motion related to pore pressure changes at depths greater than 5000 m. In addition to providing reservoir insights, InSAR has proven incredibly valuable when it comes to monitoring and identifying loss of containment events. As CCUS becomes implemented at an increasing pace and scale globally, InSAR will be an even more critical tool for surveillance programs, allowing operators monitor plume evolution and to quickly identify unwanted migration of fluids/gasses through well infrastructure or caprock discontinuities.

Following an overview of InSAR technology, this presentation will provide participants with recent case studies showing how InSAR displacement data has been used by operators to directly identify and characterize loss of containment events related to caprock and well integrity failures. Also highlighted will be the proactive use of InSAR displacement results to protect wells from shear failures related to surface heave or subsidence.

The key message of this presentation is that satellite based InSAR is a proven and reliable way to monitor asset integrity as it relates to both wells and caprock.

Biography:
Courtney Lucente is a Professional Geologist with over 10 years of resource industry experience and several years of experience in the InSAR (Interferometric Synthetic Aperture Radar) industry. In her time in the resource industry she worked extensively with InSAR data for geomechnical caprock and well integrity initiatives. She was a leader in developing novel methods for integrating and interpreting ground displacement results with other subsurface datasets to provide high quality asset integrity assessments. She now works to implement InSAR solutions globally for a range of Oil and Gas and CCUS projects.

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Economic Surprises of Late-Life Production

Dwayne Purvis, P.E.
Purvis Energy Advisors

Abstract:

For years, decommissioning costs were an after-thought to decision-making. They did not affect cash flows or business plans, and sometimes reserve reports did not even include them. Now, many legacy fields both within the U.S. and globally are declining to their final life stage. Even with many producing years remaining and a positive net present value, the total future cash flow can be – surprisingly – negative.

Operators may not be ready for the unexpected reality since our industry has spent too little forethought on quantifying the scope of decommissioning, estimating its costs, ensuring security for the long term, and especially preparing funds for the surprisingly early onset of those costs. Though the price boom of recent decades delayed and distracted from the inevitable, natural depletion and the outlook for declining oil demand bring the issue to front. Now the industry finds itself with insufficient nomenclature, knowledge, or practices to handle decommissioning well.

This presentation explains the unexpected late-life economic dynamics, the dangers they create, and how to foresee and avoid financial and environmental traps.

Biography:

Dwayne Purvis, P.E. has spent nearly 30 years in reservoir engineering and executive leadership as a consultant and operator. He has led or participated in hundreds of engineering and strategic studies over dozens of basins in the United States and abroad. Mr. Purvis leads Purvis Energy Advisors, and he frequently teaches, speaks, and writes for industry organizations and for Texas Christian University.

Dwayne is a registered professional engineer in the state of Texas, member of SPEE, AAPG, SEG, SIPES and an active, 25-year member of SPE. He has also recently completed a Master of Arts in sustainable energy at Johns Hopkins University.

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CO2-EOR and Sequestration: Challenges on Pore Scale

Erdal Ozkan
Colorado School of Mines

Abstract:
Although the awareness of the environmental impact of energy production and utilization are on the rise, predictions for the next 30-50 years indicate a growing energy demand of the increasing world population. Moreover, the recent experiences have revealed the risks of an immediate departure from the conventional energy sources and the importance of achieving a sustainable energy diversity. These developments unequivocally point to the continuing contribution of oil and gas to the supply of uninterrupted and effordable energy with an increased awarness of its environmental impact.

This presentation addresses CO2-EOR and sequestration as critical contributions of the oil and gas industry to a sustainable energy diversity with environmental conscience. Although CO2-EOR and sequestration can be applied in conventional and unconventional reservoirs, the size and abundance of tight, unconventional reservoirs offer special opportunities. However, the micrometer to nanometer pore sizes of unconventional reservoirs pose challenges to our conventional reservoir wisdom and take us out of our comfort zone.

In this presentation, I discuss CO2-EOR and sequestration with an emphasis on the challenges in small-/ultra-small-porosity reservoirs. I present research highlights and laboratory and field examples to emphasize the role of complex molecular level reactions between the injected/stored fluids with the resident fluids and reservoir rock during CO2-EOR and sequestration. The "main takeaway" of this presentation is that CO2-EOR and sequestration are critical technologies for our contribution to energy diversity — but we must look beyond our conventional reservoir wisdom and develop effective technologies to meet the energy demand while reducing its carbon footprint.

Biography:
Erdal Ozkan is a professor of Petroleum Engineering at Colorado School of Mines. His areas of expertise are reservoir engineering, fluid flow in porous media, PTA/RTA, and unconventional reservoirs. Ozkan is a Distinguished Member of SPE and the recipient of the Lester C. Uren, Formation Evaluation, and Rocky Mountain North America Reservoir Description and Dynamics awards. He has served as the SPE Reservoir Technical Director, Co-Executive Editor of SPEREE, and Chief Editor of the Journal of Petroleum Science and Engineering. Ozkan has over 170 technical papers, one book, and several book chapters. He is also a former SPE Distinguished Lecturer (2011-2012).

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Integrated Geoscience and Engineering to Improve Hydraulic Fracturing and Field Development

Erich Kerr
SM Energy

Abstract:
Integrating multiple types of modern field technologies systematically has led to improvements in field testing, understanding, and acreage development in geologically complex formations. These efforts are proving to be invaluable when coupled across disciplines and combined with simulations for predictive evaluations. Several field case studies will be provided to illustrate the benefits of the multi-pronged diagnostics with modeling approach, which include pairing fiber optics, sealed wellbore pressure monitoring, formation imaging, calipers, and microseismic together. Multi-disciplinary datasets from before, during, and after stimulations will be combined into geomechanics models to inform stage and cluster level details derived from field diagnostics that include stimulation and production performance behaviors. An additional case study will connect post-stimulation diagnostics by including downhole erosion imaging, offset strain monitoring, and production warmback analysis to provide comprehensive insight for field development.

These case studies illustrate how improved geomechanics modeling, application of field data, collection of the necessary diagnostics, and testing methods may be used across disciplines to effectively inform geoscience and reservoir characterization understanding, completion design, diagnostics, resource development, and well performance.

Biography:
Erich Kerr is SM Energy's Engineering Supervisor for Reservoir Characterization, leading completions design, simulation, and exploration / resource evaluations. Erich is currently the lead engineer over the Department of Energy Austin Chalk / Eagle Ford Field Laboratory, which includes multiple stacked diagnostics and top researchers (Texas A&M, Stanford, LBNL). Erich was a former SPE Student Chapter President and now serves as an SPE Committee member and Discussion Leader on Forums / Workshops focused on Hydraulic Fracturing and Field Development. Erich holds a BS from Colorado School of Mines in Petroleum Engineering and has authored over 19 technical publications.

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Recommended Practice for Safe Well Positioning, Separation, and Surveying

Jonathan Dale Lightfoot
Oxy

Abstract:

Ensuring accurate wellbore placement and safe construction is crucial in all subsurface borehole applications. To this end, the American Petroleum Institute (API) has developed a new technical standard titled API Recommended Practice 78, Wellbore Surveying and Positioning (RP 78) which covers a wide range of industries including oil and gas, geothermal, carbon sequestration, coalbed methane, horizontal directional drilling, mineral ventilation, and scientific coring. The standard was created by independent consultants, industry experts, academia, and public and private energy operators with the goal of providing modern engineering practices for subsurface boring industries.

The Operator's Wellbore Survey Group (OWSG), a sub-committee of the Industry Steering Committee on Wellbore Survey Accuracy (ISCWSA), initiated the development of API RP 78 to address the lack of minimum industry-wide standards for safe wellbore positioning and separation from sub-surface hazards. The ISCWSA is equivalent to the Society of Petroleum Engineers (SPE) Wellbore Positioning Technical Section.

API RP 78 is available through API's standards development process and aims to improve confidence in wellbore subsurface position and reduce uncertainty and will hopefully be embraced by all wellbore construction participants with industry-wide adoption.

Biography:

Jonathan Lightfoot is a Principal and Senior Drilling Engineering Consultant at Oxy. His primary role at Oxy is to support global drilling operations as a Directional Drilling Specialist. He has 26 years of oil and gas industry experience specializing in wellbore positioning and directional drilling. Lightfoot chairs the Operator’s Wellbore Survey Group (OWSG), a subcommittee of the SPE Wellbore Positioning Technical Section (WPTS), and is the vice-chair of the API RP 78 Task Group developing its Recommended Practice for Surveying and Wellbore Positioning. He earned a Bachelor of Science in Mechanical Engineering from the University of Louisiana at Lafayette.

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Fractional Dimension Rate Transient Analysis (FD-RTA): A Key to Unconventional Wells and Complex Fracture Networks

Jorge A Acuña
J Acuna Consulting, LLC.

Abstract:

Unconventional wells show features that make them very difficult to characterize. One of them is the "transitional" flow regime that lasts months to years and is different from known flow regimes such as linear or boundary dominated flow. Fractional Dimension RTA (FD-RTA) is based on work on fractals and fractional dimension systems from the late 80's and early 90's. These principles were significantly expanded with innovative elements, rigorous solutions, modeling techniques, and adapted to the geometry of unconventional wells. The result is FD-RTA, a new technique to analyze and understand fracture networks ranging from complex ones with rock fragments of many different sizes to simple ones with equally spaced fractures. This lecture explains the evolution of these ideas and the power of the fractional dimension approach to explain "transitional" flow regimes as the result of fracture complexity. In this new approach, known flow regimes such as radial or linear flow are only special cases of a single general transient solution. The approach can be easily converted to a numerical model and explains several previously unexplained features, such as rapidly increasing gas-oil-ratio, apparent fracture closure with time, etc. The power of FD-RTA is demonstrated by applying it to parent-child well interference. I would like the members to take away the idea that basic methods for pressure and rate transient analysis can explain previously unexplained features of unconventional well behavior but only when the correct model for fracture geometry is considered.

Biography:

Dr. Jorge Acuna graduated from USC in 1993, where he worked on transient behavior of fractal networks of fractures. He joined Chevron (then Unocal) in 1996. He became a leading expert in geothermal modeling and reservoir engineering. He started work in unconventional pressure and rate transient analysis in 2012 and developed Fractional Dimension RTA between 2016 and 2020. The method was published and implemented in commercial software. He retired from Chevron in 2022 to start his own consulting firm J. Acuna Consulting. He has authored more than 30 papers, regularly reviews SPE papers and has participated as session chair in SPE conferences.

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Geomechanics for Field Development and Production Management - experience from two decades of reservoir geomechancis studies

Juliane Heiland
SLB

Abstract:
Modern numerical 3D Geomechanical models can provide detailed subsurface geological understanding to predict failure events impacting reservoir engineering and production management.
Geomechanical models have become a standard input for drilling engineering and well planning and in many companies geomechanical teams today work closely with drilling teams. The same integrated modeling and engineering approach has not taken hold yet when considering reservoir engineering and production management, where the use of geomechanics models and close cooperation between geomechanics and engineering teams can still be improved.
My presentation shows how modern models provide the geomechanical tools to analyse potential wellbore and reservoir failures that can impact production. I will show the useful characteristics a geomechanics model should have to solve production challenges and influence reservoir management decisions.

Biography:
Juliane Heiland is a Geomechanics Advisor at SLB focussing on rock and soil mechanics applied to a wide range of engineering domains. Her first degree in Engineering Geology from the Technical University Munich gave her a solid geological sciences foundation applied to civil engineering and tunneling. A PhD (from 1994 to 1998) focussed on landslide research in Italy, Germany and the Czech Republic. Academic post-doc research at the GeoForschungsZentrum Potsdam focussed on laboratory solutions through high-pressure rock mechanics experiments applied to problems in tunneling and geothermal well productivity.
She joined SLB (formerly Schlumberger) as a research scientist in 2001 and worked six years in geomechanical research towards sanding and perforating. In 2007, Juliane moved into field consulting services providing geomechanics engineering solutions to SLB clients in Africa and Europe. After a brief move to the operator side of the industry with Maersk Oil, providing wellbore stability analysis for drilling planning, she returned to SLB in 2015. As Geomechanics Advisor since 2018 Juliane concentrates on training the next generation of geomechanics engineers at SLB and with operators in the wider industry as well as providing input to consulting studies worldwide.

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Designing Optimal Wells with Inflow Control Technology

Kåre Langaas
Aker BP ASA

Abstract

The lecture shows a systematic approach to continuously improve the lower completion design process, primarily relevant for long horizontal wells with sand screens and inflow control technology (ICT). ICT can enable optimal inflow into a well and can help choke unwanted fluids. The potential is enhanced value and environmental benefits such as reduced CO_2 emission. Since the first SPE paper on ICT in 1994, the industry has evolved towards autonomous inflow control technologies (AICT). Langaas has managed flow performance testing of multiple AICTs 2015-2023 as well as the correct modelling and evaluation of ICT wells in the reservoir model. The achieved improvements are a result of open collaboration with several technology vendors and inter-disciplinary teamwork. The success recipe applied for more than 40 horizontal branches consists of eight steps. Each step will be explained by examples.

1. Understand the reservoir and the key objectives for the well.
2. Understand and chase improvements in ICT.
3. Make a mathematical model of the ICT.
4. Pre-drill design studies of the well. Understand the best ICT and establish the lower completion strategy.
5. During drilling, update the understanding and models according to the actual drilling result. Update the design and position any in-well tracers optimally.
6. After start-up, secure good well surveillance including a tracer-based (or mechanical) production log.
7. Perform history match of well performance to compare the lower completion model with the observed data, incorporating the inflow estimates.
8. Learn and improve.

Lecture key take-away: A systematic approach to design better wells.

Biography:

Kåre Langaas is a Senior Advanced Reservoir Engineer at Aker BP. Langaas has a PhD in physics from University of Bergen in close collaboration with University of Oxford and has 30 years' experience within reservoir technology research, reservoir engineering, field developments and reservoir management. He was the Chief Reservoir Engineer for Det Norske and Aker BP 2015-2020 and has since been Principal Advisor for lower completion design and in-well tracers. Langaas is author/co-author of more than 25 papers/publications and has been responsible/driver for Alvheim area testing/deployment of AICT and tracer technology, contributing to Norwegian Petroleum Directorate IOR price for 2018. Langaas is a member of SPE.

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Redefining Recovery in the Eagle Ford: Refracs and Infill Development Lessons Learned From the Hydraulic Fracturing Test Site 1 (HFTS) Phase 3

Kourtney Brinkley
Devon Energy

Abstract:
Over the last several years, great strides have been achieved in understanding depletion networks, parent/child well interaction and full field completion strategies. However, counter to these learnings, the amount of open acreage and virgin rock in unconventional reservoirs have begun to shrink as development has occurred. The natural question that comes next is, 'How to recover stranded reserves left behind from sub-optimal development strategies?'. This presentation highlights the premise of recovering stranded reserves by utilizing pre-existing wellbores alongside new-drill infills to yield a more effective and economic outcome.
A multidisciplinary approach is summarized to evaluate reservoir drainage patterns, parent/child, and hydraulic stimulation interactions. This presentation describes a case study of an extensive diagnostic package focusing on the capture of stranded reserves via refracs and infill drilling within the black oil window of the Eagle Ford Shale, DeWitt County, Texas. The project consisted of a unique combination of two cemented liner refracs in conjunction with additional primary (parent) wells, new infill wells, and a horizontal well devoted exclusively to observation. The collection of a horizontal core, formation imaging and advanced lateral logs, sealed wellbore pressure monitoring (SWPM), downhole fiber-optics (both permanent and deployable), seven downhole pressure gauges, time-lapse geochemistry, and iterative production interference tests were also captured. Vital calibration for well spacing, completion strategy, and field development were all outcomes of this project. Additionally, confirmation of new drainage in standard reserves, increased recovery factors, and 27-46% increases in ultimate recoveries were all measurable successes from this project.

Biography:
Kourtney Brinkley is a Senior Reservoir Engineer at Devon Energy. She has also served as a Geologist, Drilling and Completions Engineer and Production Engineer. Kourtney has worked the STACK, Eagle Ford, Powder River and Delaware Basins. She is a graduate of Oklahoma State University with a bachelor's degree in Geology and holds a second bachelor's degree in Petroleum Engineering from The University of Oklahoma, where she serves on the Industry Advisory Board. Kourtney has authored multiple papers, been a keynote speaker at HFTC twice and received the 2023 Completions Optimization and Technology Award for the SPE Mid-Con section.

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Pathway for Recovering Valuable Elements of Interest from Subsurface Brines and Oilfield Produced Waters

Dr. Kyle E. Murray
Murray GeoConsulting, LLC

Abstract:
Water that is co-produced with oil and gas is referred to as produced water. This water originated as seawater that occupied the pore space of marine sediments at the time of deposition. Over geological time, the sediment is buried, consolidated, and lithified, while minerals dissolve into the formation water. This "geologically-aged" seawater becomes a subsurface brine that can have total dissolved solids concentrations 10 times higher than the original seawater. After separating produced water from oil, the wastewater is normally disposed into saltwater disposal wells. However, because wastewaters and residual solids contain critical minerals (CM), rare earth elements (REE), and other elements of interest (EOI) that are in demand for medical, computer, and energy technologies, they are a potential resource in a twenty-first century circular economy.

A pathway for recovering EOI includes assessment of commodity markets, characterization of waters and wastes for EOI concentrations, and computation of gross values of EOI in $/bbl or $/tonne. Then evaluation of technologies that are economically favorable for extraction of the EOI. Indications are that 10 or more EOI can be economically extracted from subsurface brines and oilfield produced waters. Case studies and results from ongoing projects are presented including characterization of more than 60 EOI in produced water samples. The approach could be applied in any region of the world to assess potential for resource recovery of EOI from seawater, brackish water, subsurface brines, produced water, or solid wastes. The characterization and recovery of EOI from produced water will feed a circular economy.

Biography:
Dr. Kyle E. Murray is the Principal Scientist of Murray GeoConsulting, LLC. He earned a Ph.D. in Geological Engineering from Colorado School of Mines and has worked on geoscience projects since 1995. Dr. Murray's experience as a consultant or researcher is in hydrogeology, natural resources and GIS databases, water resources, induced seismicity, produced water management, and resource recovery. His current focus is to evaluate produced water from the oil and gas industry, characterize it for elements of interest (EOI), and pursue economically viable alternatives to recovering critical minerals and other EOI from produced water, other waters, and wastes.

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Making Unconventionals Competitive – Minimizing the Cost per Barrel Oil

Leen Weijers
Liberty Energy

Abstract:
Our industry's innovation to successfully frac and produce from shale, the source rock for hydrocarbons, has dramatically changed global energy access and geopolitical balances. The North American shale industry has relentlessly pushed for a lower cost to bring a barrel of oil ($/bbl) or a cubic foot of natural gas ($/scf) to the surface. This reduction has greatly benefitted world energy consumers.

The dramatic reduction in this cost ratio is sourced in two metrics. First, cost of drilling and completion has been cut in about half for shale wells over the last decade through efficiency gains and innovations in workflow. Second, well production has roughly doubled through a focus to increase both the extent and intensity of the created hydraulic fracture system.

This North American track record of innovation, operational learnings and engineering optimization contains lessons learned for other shale basins around the world. One idea members will take away from this presentation is that our industry is capable of wide-ranging and rapid innovation when free market forces are unleashed to produce the cheapest barrel possible.

Biography:
Dr. Leen Weijers is VP of Engineering at Liberty Oilfield Services and served as its Business Manager at Liberty's founding. Leen worked at Pinnacle Technologies from 1995 to 2011, where he oversaw development of a commercial fracture growth simulator, FracproPT. Leen has authored dozens of publications, and contributed a chapter to the recent SPE Hydraulic Fracturing Monograph. Leen completed his doctoral research at the Faculty of Mining and Petroleum Engineering at Delft University of Technology in the Netherlands.

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Logging a Well? It's about time! Effect of time in logging data program design, acquisition, interpretation and integration.

Marie Van Steene
SLB

Abstract:
Should your well be logged while drilling or after drilling? What factors need consideration in making that decision? This talk will explore the effects of time in logging operations, logging data acquisition and interpretation. Acquiring log data just after the bit brings the advantage of evaluating native reservoir fluids, in addition to being able to use alternate measurements shallower than those of the standard triple combo. Early acquisition also contributes to data assurance and minimizes the effects of time-dependent borehole instability. Time is an important consideration in optimizing well placement, affecting wellbore tortuosity and net-to-gross, impacting the well production and economics. The early acquisition of data is balanced by extensive data acquisition, and acquisition of measurements unavailable while drilling that can reduce further formation evaluation uncertainty. However, the complexities of filtrate invasion and native fluid displacement need careful evaluation.
Time is an essential component in data interpretation and integration. The early availability of integrated and interpreted data can have a significant impact on wellbore completion and production, making automation and the development of digital workflows important to realize needed efficiencies.
This talk will examine examples and case studies, from logging while drilling to reservoir surveillance and monitoring. It will provide practical recommendations on how to make the best decision regarding the optimum time for logging to achieve your logging objectives, while addressing your reservoir challenges and balancing well condition.

Biography:
Marie Van Steene is a principal petrophysicist and is presently LWD Petrophysics Domain Champion for SLB Well Construction Measurements in Saudi Arabia. Marie graduated in 2000 with a MSc in Mechanical Engineering from Ecole Centrale Paris and Universite Libre de Bruxelles. She started in 2000 with SLB as a Wireline Field Engineer and went on to work in Australia, New Zealand and India. She started her petrophysics career in 2006 in Malaysia. She then worked in Egypt and Kuwait, and moved to Saudi Arabia in 2016. Her interests include formation evaluation in open hole and cased hole. She has been a leader of the SLB Dielectric and NMR special interest groups for several years. She is currently VP Technology in the SPWLA Saudi Arabia Chapter committee.

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Tip Screen-Out (TSO) Fracturing : An Enduring Technology
(How we started, What has been achieved and Where it is going)

Martin Rylance
MEDCO Energi Ltd and THREE60 Energy Ltd

Abstract:

The focus on unconventional technology has been considerable over last 15-20 years, while conventional operations have continued to deliver efficiently across the global Oil& Gas business. This presentation is an update on the development, broad application and also the continued success of the specialised TSO technique.

The presentation will describe the initial development of the TSO process, it's design, first deployment, further refinement and ongoing application. A suite of industry case histories will demonstrate that every major Operator in every major Basin worldwide has successfully applied the technique to enhance production, where its use was both appropriate and possible. From highly specialised application in the North Sea, to field developments in higher permeability in both Alaska and Siberia. From employment as a recovery-factor enabling solution in gas-condensates to its inherent core delivery of the Frac-Pack technique, which is a key sand-control completion method, crucial to soft-rock oil production delivery.

Throughout, the presentation will also describe the extensive surveillance that has been performed and confirmation of the effect of the TSO process, through a variety of methods. All of the supporting evidence for the approach will demonstrate how invaluable this technique has become to the Oil & Gas industry.

In summary the presentation will demonstrate the value which this technique has provided in all its forms and how it continues to deliver. It will enshrine the knowledge and lessons learned over 40 years of application and ensure that any short-term technical direction does not run the risk of disregarding the previously hard-won experiences of previous decades. Cemented into conventional fracturing technologies the TSO process demonstrates a longevity associated with fundamentally sound engineering. Finally, new areas and understanding of this valuable approach continue to push back the boundaries and open up even more opportunities.

Biography:

Martin Rylance is the Discipline Lead and Distinguished Advisor for Reservoir and Well Enhancement at MEDCO Energi Ltd and THREE60 Energy Ltd. Previously he worked at bp, their NOJVs and partner companies for more than 38 years. Having lived in 12 Countries and pumped in more then 55 Countries he has generated a truly International footprint in fracturing, sand control, stimulation services, well control and multilateral drilling. He is a co-author of several books, including "Modern Fracturing: Enhancing Natural Gas Production", and author of more than 250 industry technical papers, articles and patents. He holds a BSc (Hons) degree from Salford University, is a Chartered Mathematician and also a Fellow of the Institute of Mathematics.

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Low Cost, High Profit Rejuvenation of Mature Fields

Mike Gunningham
Mike Gunningham Consultancy

Abstract:
This talk looks at practical strategies, processes and applications for mature fields, focusing on reducing operational costs and maximizing value creation from existing wells and facilities. You will take away tools and processes that you can apply quickly, efficiently and low cost, to maintain and maximize production and injection. In mature field operations, the primary focus is on safety and keeping costs down. We will show that Production Optimization can rejuvenate a mature field and can extend its profitable life. This is done by building integrated teams, using data analytics, carrying out Produce the Limit workshops and identifying opportunities to debottleneck, rejuvenate and optimize wells and facilities. It is important to look just as closely at water injection, as well as oil and gas production, to optimize reservoir management and maximise recovery. We will demonstrate that by identifying and capturing these opportunities, ranking and prioritizing them, the team can then focus on efficient and effective delivery. This maintains, restores or increases production and injection, which extends profitable field life, maximizes recovery and reduces unit costs. A number of case studies will demonstrate that with whatever data you have, you can always find opportunities to increase production. This is done by safely manipulating the operating envelopes of existing wells and facilities, carrying out systematic well and reservoir surveillance, optimizing chemical treatments, daily artificial lift optimisation, maximizing facility capacities, implementing low cost interventions, locating remaining oil and gas, restoring shut-in wells, as well as designing/executing workovers and sidetracks, when the prize is significant.

Biography:
Mike is currently the Principal Petroleum Engineering Consultant for the Mike Gunningham Consultancy, with over 35 years' experience around the word in oil and gas fields, in Production Technology, Production Optimisation, Well and Facility Integrity, Well, Reservoir and Facility Management (WRFM), Waterflooding and Enhanced Oil Recovery. He was a Principal Consultant in the SGS Subsurface Consultancy for 5 years, responsible for all Brownfield applications and Technical Due Diligence. Before that, Mike was the Head of Subsurface Support Team in Maersk Oil in Qatar (MOQ), as well as the Well, Reservoir & Facility Management Team Lead in MOQ, rolling out and embedding WRFM in the Al Shaheen oilfield. Mike has worked for Shell for 26 years, based mainly in Holland, while working all over the world on numerous projects (Bonga, Nigeria NLG, Brunei, Malaysia, Oman, GOM, Canada, Brazil, New Zealand, and half of the North Sea). Mike graduated from Bradford University with a Chemical Engineering degree before completing his MSc in Petroleum Engineering at Imperial College. He has been a member of the SPE since 1984 and is currently representing the SPE on the IPTC Board of Directors. He has received the 2022 SPE Europe Regional Service Award and 2010 SPE North Sea Region Award for Production & Operations.

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New Frontiers in Intelligent Completions

Dr. Muhammad Arsalan
Saudi Aramco

Abstract:
Managing uncertainties in reservoirs, particularly in carbonate rocks, is a major challenge. Intelligent completions give the ability to monitor and control specific zones within wells. Without this control, the well may be lost when a zone unpredictably waters out and require mechanical intervention with its associated risks and costs. Most of the existing intelligent completions are limited to the newly drilled wells or cased holes. The challenge is to economically convert exiting open-hole horizontal wells into smart wells to achieve real-time monitoring and control for optimal recovery, enhanced production, and maximum operational efficiency.

A large number of wells are completed at open-holes with no casing, tubing or umbilical available for power and communication. With the aging of these oil wells, unwanted gas and water break-thru are commonly reported issues. With most of these wells in horizontal open-hole configuration, this leads to a work over, or in extreme cases, abandoning or sidetracking of the wells. These solutions are expensive and require a rig to perform the job. A rig is an expensive and scarce commodity that results in long wait times and lost production. To resolve these issues, the revolutionary Thru-tubing Retrievable Intelligent Completion System (TRICS) is conceptualized that is based on thru-tubing access for both initial completion and future modifications and replacements of existing, as well as, newly drilled wells.

Award-winning TRICS is a rig-less deployed, on-demand, modular, real-time, monitoring and control solution targeted for open-hole horizontal wells. Unlike commercially available solutions, TRICS is a "free-form" platform that can be deployed ‘only’ when needed. TRICS consists of game-changing technologies that will revolutionize production engineering and reservoir management.

Biography:
Dr. Muhammad Arsalan is a seasoned professional with over 25 years of experience in academia and various industries including energy, space, semiconductors, biomedical, and chemicals. He has over 100 international patents and publications related to advanced sensors, systems, and tools. He is the recipient of 2022 SPE Completions Award for MENA region and multiple national and international awards and distinctions for his entrepreneurial skills and groundbreaking contributions in research and innovation. He is leading a team of experts in multiphase metering, advanced sensing, and robotics at Saudi Aramco's Advanced Research Center. His team is working on innovative surface and subsurface production monitoring, control, and optimization technologies.

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CO_2 Storage Resource Management System – Application and Learnings from World's First Booking

Paul Lyford
Santos Ltd

Carbon capture, utilization and storage (CCUS) is experiencing rapid growth and the ability to classify and compare projects across the globe is of increasing importance. The CO_2 Storage Resources Management System (SRMS) has been designed to provide the common framework and is increasingly being applied across the industry. The SRMS has been seeded from the widely used Petroleum Resources Management System (PRMS), which makes it ideal for industry professionals familiar with the concepts of classification and categorization.

The SRMS was applied to an onshore project by an Australian oil and gas company in 2021 and led to the world's first public reporting of CO2 storage quantities under the SRMS classification system. Standard reserves workflows and systems were modified for CO2 evaluation and reporting, resulting in a streamlined processes throughout the organization. Multiple benefits were realized such as standardized evaluation and reporting, a unified language across the company, and enhanced formality in CCUS reporting.

As more CCUS projects are proposed, a robust classification system has become vital to communicate consistent terminology, valuation methodologies, and reporting systems for identifying project status and differential between projects. The application of the SRMS is highly recommended for stakeholders, financiers, or regulatory bodies involved in the commercial development of a CCUS project.

Biography:

Paul Lyford is the Reserves and Resources Manager at Santos Ltd, an Australian oil and gas company and the first to add CO2 Storage resources to the annual reserves report. Paul has over 30 years experience and has been involved in many field developments across Australia. He has a background in reservoir engineering, operations, planning, strategy and commercial. He is a Fellow of the Institution of Engineers Australia, a member of Society of Petroleum Engineers (SPE) and member of Society of Petroleum Evaluation engineers (SPEE). Paul holds an honors degree and PhD in Engineering from University of Melbourne and post graduate qualifications in Finance. Paul is currently a member of the SPE CO2 Storage Resources Committee (CSRC) and involved with the SPE SRMS subcommittee charged with updating the SRMS.

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Technology Keystones: Mainstreaming MWD and Rotary Steerables for New HT Geothermal Development

Robert Estes
retired

Abstract:
Geothermal field production improves, as with petroleum fields, when well placement maximizes the surface area that is exposed to the optimal target resource. Whether the reservoir is hydrocarbon-bearing rock or heat-bearing rock, there are common objectives. The goal is usually to get the largest possible production pipe into the perfect location near this resource, over the longest section, and delivering the highest flow rate.

Oilfield drilling technologies like Measurement While Drilling (MWD) and Rotary Steerable Systems (RSS) can enable long lateral sections and complex multiple-well deployments, which require precision wellbore positioning. Enhanced (EGS) and Advanced (AGS) Geothermal Systems require accurate placement of long, smooth wellbores, often in close, parallel proximity. EGS fracture networks must intersect both injector and producer wells, so the inter-well spacing must be precisely controlled. AGS is often based on intersecting two or more wellbores at depth - a difficult positioning task even in shallow, low-temp formations. Drilling with MWD and RSS can optimize these geothermal multi-well developments, if the tools can be ruggedized for high temperature (HT), hard rock environments.

But common availability of reliable HT MWD and RSS oilfield drilling tools took decades to reach 200°C. Maximum tool operating temperature rose in incremental steps of 25°C, taking nearly 10 years to mature a fleet of tools for each increase in capability. There are several weak links, when it comes to geothermal conditions, in these drilling tools.
So consider: "How can we leapfrog quickly to 300°C for geothermal development?"

Biography:
Robert has 45 years in MWD and drilling technology, working for all three major service companies. His expertise is in HP/HT design and packaging for downhole directional instruments, and he holds 30 patents. He led two 300°C drilling tool projects at Baker Hughes. For SPE, he has delivered numerous talks and papers; also for IEEE, IMAPS (HiTEC), ION, NASA-JPL, API, and IADC-DEC. Robert serves on the UtahFORGE STAT geothermal advisory team. An SPE Senior Member, he has volunteered in the MWD Section; the 2006 ATW on HT/HP Drilling; SPE-WPTS (ISCWSA); SPE-DSATS; as Director, SPE-GCS; and the SPE-GCS Northside Study Group.

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Well Dynamic Simulation – Challenging the “Just Do This” Approach

Ryosuke YOKOTE (Rio)
Eni Australia

Abstract:
Over the last decade, dynamic simulation has increasingly been integrated into day-to-day well and production operations, and decision-making processes. This presentation will showcase well dynamic simulations supporting the full life cycle of well operations, including well clean-up, field start-up, production operations, well intervention and field abandonment. These case studies highlight the importance of a cross-disciplinary approach to foster strong collaborations between the field-based supervisor and the office-based engineer carrying out the simulations. When operational parameters are properly incorporated into simulations, the results can provide great insights, enabling field supervisors to carry out operations in a safe and efficient manner. Field supervision becomes more relaxed and assured as emergent situations have already been anticipated through simulations that include multiple what-if scenarios. A successful application of well dynamic simulation provides an informed challenge to experience-based bias that is common in operations organizations, which often results in a "just do this, because it worked well in the past” approach. So, let's simulate operations to anticipate the expected and unexpected before going out to the field. Your operations will be safer, more predictable, and more enjoyable!

Biography:
Ryosuke YOKOTE (Rio) is a Senior Petroleum Engineer with Eni Australia. He has over 29 years of industry experience in Australia, Timor-Leste, Indonesia, and Japan. His experiences include operations engineering support, planning and supervising various well operations, flow assurance engineering as well as hands-on drilling crew during the early days of his career. He has authored and co-authored multiple technical papers on intelligent completions, advanced perforation technique and application of well dynamic simulation to support operations. Rio graduated from Tohoku University in 1993 with a BSc and in 1995 with an MSc, both in Resource Engineering.

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Multiphase Metering - A Digital Tool for Decarbonization

Sakethraman Mahalingam
Aramco Overseas Company UK Ltd

Abstract:
Multiphase meters are used to measure the flow and composition of hydrocarbons and are a key part of an operator's Digitalization Toolkit. According to the World Bank, Digitalization on its own can cut our carbon emissions by 20%. The lecture outlines the evolution of multiphase metering technologies over the past 25 years and their role in the optimization of hydrocarbon production by providing continuous, accurate measurements. The talk demonstrates via several case studies that multiphase meters can also help in decarbonization. This is particularly true of Scope 1 and 2 emissions as the use of multiphase flow meters will reduce testing using portable separators. Furthermore, as the energy industry pivots towards Carbon Capture and Storage (CCS) and Hydrogen to mitigate Scope 3 emissions, the measurement of flow and composition of these gases across the whole value chain is crucial to make the economics of CCS & Hydrogen work. The lecture touches upon the challenges in metering CO2 and Hydrogen, and explores potential adaptations to current technologies to address these challenges. In summary, the intersection of two key trends in the energy industry - Digitalization and Decarbonization - with Multiphase Metering is propelling its evolution from a specialized technology to a ubiquitous tool shaping our low-carbon future.

Multiphase meters are needed to accurately measuring the flow of hydrocarbons, which is akin to measuring an operator's revenue. As a Digitalization tool, multiphase meters can also reduce an operator's carbon footprint and may be adapted to measure the flow of new energy gases such as CO2 and Hydrogen.

Biography:
Sakethraman Mahalingam has been working on the measurement of flow and composition for the Oil & Gas industry for the past 18 years. He currently works as Research Consultant at the Aramco Overseas Company in Aberdeen, UK, which is a part of Saudi Aramco's Upstream research group. Over the past 6 years at Aramco, he has developed many multiphase flow metering technologies from concepts on paper to prototypes in the field. Prior to joining Aramco, he worked at the General Electric Company (GE) and Baker Hughes. At GE, he led the successful development of the electrical impedance tomography technology for the GE Safire™ Multiphase Flow Meter. At Baker Hughes, he developed the Zenith™ downhole flow and water-cut sensors. He serves as a member of the Committee of Petroleum Measurement at the American Petroleum Institute (API), the British Standards Institution (BSI) and the ISO. He has over 25 patents and over 30 conference and journal publications in the area of multiphase flow measurement. He completed his PhD in Mechanical Engineering from Georgia Institute of Technology, Atlanta, USA in 2005.

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Coiled Tubing: The Journey Toward Automation and Beyond

Santiago Hässig Fonseca
SLB

Abstract:
The journey toward autonomous coiled tubing operations is steadfastly approaching the finish line and reshaping the way that operations are designed and executed. Service providers and operators alike should be prepared to welcome and leverage these changes.
The journey began three decades ago with the advent of real-time monitoring of downhole data. During the initial introduction of real-time monitoring technologies, the downhole tools delivered data to the surface which helped the service providers optimize their intervention on the fly. About a decade later, on-demand activation of downhole tools added to the measurements to create increasingly sophisticated workflows. Examples of this include detonating perforation guns, anchoring packers, and intervention workflows capable of delivering multiple objectives in a single run. In the third and last stage—nearly three decades after the initial introduction of real-time monitoring in coiled tubing operations—service providers are focusing on automating tasks to improve operational efficiencies and safety.
This lecture reviews the evolution of downhole real-time data and the growing complexity of operations in terms of the available data, the methods used to generate actionable insights, and the applications that these insights and capabilities have enabled. This evolution has taken coiled tubing from a service that was traditionally seen as primitive and limited to basic applications, to one that is capable of reliably and efficiently addressing the most complex challenges in well interventions. The lecture concludes with a discussion of the trajectory for coiled tubing operations and the last mile of this journey toward autonomous operations.

Biography:
Santiago Hässig Fonseca is the Domain Lead for Reservoir Performance Digital Solutions at SLB. He has 13 years of experience as subject matter expert in the field, research, engineering, sustaining, and software. He has specialized in enhanced coiled tubing with real-time downhole telemetry, and has been involved in hardware development, intervention design and execution, and data interpretation. Hässig has developed new methodologies to transmit data in real-time and data processing techniques to detect downhole events. He has authored 4 journal articles, 2 magazine articles, 11 conference papers, and 4 patent applications related to coiled tubing technology and data processing techniques.

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Well DecomMISSION:
Develop Sustainable Approaches to Decarbonize and Repurpose Wells

Steven Allan Canny
Weatherford International

Abstract:
Join the Well DecomMISSION: to create sustainable approaches to decarbonize and repurpose wells.

Well decommissioning has come a long way in 100+ years in its complexity, scale and cost magnitude. However at its core it still maintains a dual barrier approach to preventing potential flow to the surface from permeable water and hydrocarbon zones.
The fundamental geological approaches remain similar, and technology has also developed far beyond the early equipment used . Delivering higher precision in the measurement, preparation and qualification of wellbores.

The scale of operations has also changed dramatically, with factory and simultaneous operation projects are now commonplace, far beyond the labour intensive operations of the 1900's.
All these factors combine to reduce the risk on placing lateral isolation in wells.
There is a series of challenges which haven't yet been overcome in 100+ years – how can we sustainably decarbonize upstream oil & gas operations through sustainable well decommissioning? Our Well DecomMISSION.

The presentation reviews the challenges to creating sustainability in well decommissioning. Starting with asset economics, an overview of well decommissioning subsurface and well operation fundamentals. Then it pivots to enablement, discussing the design of disruptive operation structures and development of sustainable well decommissioning operations which reduce environmental and financial risk. The considerations for design for decommissioning and carbon capture re-purposing are discussed, to assess the governance and structures needed to create value from the wellbore.

The closing discussions focus on the vision that sustainable well decommissioning at the end of its production life, should be the enabler to decarbonize well operations through repurposing the asset. Enabling higher hydrocarbon recovery rates through sidetrack drilling and bypassed oil production, or repurposing the wellbore to carbon capture and sequestration operations.

Biography:
Steven Allan Canny is the Global Director for Well Abandonment with Weatherford, based in the United Arab Emirated. He has worked across five continents in engineering, sales, regional management and global leadership roles in the well decommissioning sector. He holds a Bachelor of Science in Design Engineering, and has granted and pending patents in well intervention and decommissioning equipment. He is also an active author on the subject with 38 publications, including 13 manuscripts.
Most recently Steven has developed the EPSm contracting approach for end to end Well Decommissioning and commercialized several first in the sector in Central Asia, South East Asia and Australasia.

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Well Construction Transformation For A Digital And Intelligent Future

Waldemar Szemat-Vielma
SLB

Abstract:
Recently, the oil and gas industry has made a big step ahead in terms of digitalization and automatization particularly in the well construction process.
Traditionally, the drilling planning is a manual and iterative process with multiple disconnected applications and people working in silos. New industry data standards are simplifying the flow of information from sub-surface to drilling. Big data analytics and artificial intelligence can unlock new insights by integrating all kind of data sources into an ecosystem. Nowdays, Engineers can get simulation results and system advises on how to mitigate operational risks while all information is kept updated to ensure data coherency across functions. Seamless interconnection and interoperability between the planning and operations enables a faster and safer execution with expanded collaboration, however:

1) Why is this relevant?
2) Where are we in this journey?
3) Are fully autonomous systems the end goal?
4) What is the driver: increased ROP or increased safety, efficiency and wellbore quality?

Yet, a critical aspect introduced with these technologies is the need for management of change as roles are evolving and re-skilling programs are required. Technical and operational expertises need to evolve from machine operator to supervisor.
This lecture will make a holistic landscape review of the data interconnected sources applied to drilling planning and operations cycles in addition to the personnel competency and development. Several case studies will be discussed to conclude with key take-aways showing the current state of the well construction transformation for a digital and intelligent future.

Biography:
Waldemar Szemat-Vielma is originally from Venezuela where he graduated with honors in Petroleum Engineering and holds an Executive Master of Management in Energy from the IFP and the Norwegian Business Schools.
With more than 20 years of experience, he has worked in several countries around the world with a variety of operational, technical and managerial positions, in Operators and Service Companies. Since 2012, he has been driving the business strategy in SLB as Digital Drilling Technical Advisor and Business Development Manager.
He has over 20 technical papers, several patents and is a regular speaker at different universities, conferences and workshops.