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October 2022 – CSUR Technical Webinar

Integrated Workflows for Improved Completion Design in Unconventional Reservoirs

This technical webinar was the inaugural event for the Canadian Society for Evolving Energy (CSEE) under its new banner (formerly the Canadian Society for Unconventional Resources – CSUR). Farhad Qanbari, Senior Reservoir Specialist with ARC Resources, was on hand to elaborate on various methodologies and tools that he utilizes & integrates into his workflows to improve the productivity and enhance the recoveries from their unconventional reservoirs. The session was moderated by Chad Lemke, COO & Executive VP at GLJ Ltd.

To commence his talk, Farhad acknowledged the landscape of uncertainty within the reservoir engineering work. While establishing various workflow processes by integrating different tools, diagnostics, and analyses, the key element / goal is to reduce or minimize these uncertainties. This results in more definitive or unique solutions for reservoir characterization. Starting with simple conceptual designs to determine which properties and parameters lead to increased production and / or recoveries, and then integrating more sophisticated and specialized data & tools for a more rigorous and robust reservoir model. As the speaker indicated, the history of completion has changed significantly and continues to evolve. In addition, the tools and datasets available for incorporation into optimization work have also advanced and have become more specialized. However, the basic information acquired from DFITs (Diagnostic Fracture Injection Testing), Well Tests or Pressure Transient Analysis (PTA), and Production Data Analysis (PDA) are critical inputs along the process.

In the speaker's opinion, PDA (which incorporates results from DFITs & PTAs), Reservoir Simulation (Numerical Modeling) and Decline Curve Analysis should be conducted on every well to ascertain reservoir heterogeneities, depletion and drainage extent. To augment this work, as illustrated in his Kakwa area Montney Formation examples, one can incorporate iterative well spacing, various fracture parameters, pressure interference tests (PIT) or offset wellbore monitoring, and sand intensity sensitivities to understand their respective effects on the frac geometry, permeability & pressure distribution and overall well performance . However, he also recommended that this work be conducted on a

well by well basis as the optimal parameters in one well may not necessarily apply to other wells in the area or even on the same pad.

The amount of data from various sources can be overwhelming. Regardless, Farhad conducts the final completion design optimization work by integrating the above workflows with geo-mechanical (frac) modeling and other auxiliary tools & data, including micro-seismic data, fibre optics results, detailed PVT (pressure, volume & temperature and compositional) information, field pilot results, geoscience models, statistical analysis, and machine learning.

SUMMARY

Completion design optimization in unconventional reservoirs is a multidisciplinary task with various stakeholders which requires inter-disciplinary mixed-method approaches. Decision-making in this domain is characterized by high levels of uncertainty with incomplete data and information. The complexity of the task is associated with its multidimensional nature, the inherent uncertainties across disciplines, competing priorities, high capital costs, changing economic environment, development planning considerations, organizational setup, and resource availability. This has led to the development of project-specific completion design workflows tailored based on data availability and project circumstances.

The primary approaches for completion optimization include production data analysis (PDA), hydraulic fracture modeling, statistical analysis and data science, field pilots, and fracture diagnostics. With specific data requirements and analysis methods, each approach may provide unique insights into the performance of the existing wells and completion design of the future ones. However, the biggest opportunity lies in the integration of different approaches in a unified iterative workflow. The integration process is highly nonlinear which requires persistence, efficient teamwork, and agile mindset and management. In this presentation, integrations of the aforementioned tools for improved completion design in unconventional reservoirs the applications of the integrated workflows in Montney formation will be discussed.

PRESENTER

Farhad Qanbari
Senior Reservoir Specialist
ARC Resources

Farhad Qanbari is a senior reservoir specialist at ARC Resources. His work has been focused on well and reservoir performance evaluation and optimization in unconventional reservoirs and disposal pools using integrated workflows. Prior to working at ARC, he worked as a reservoir specialist at Seven Generations Energy, Black Swan Energy, and Saguaro Resources. He holds a PhD and an M.Eng. in petroleum engineering from U of Calgary and an M.Sc. and B.Sc. in reservoir engineering from Petroleum University of Technology, Iran. He has authored/co-authored more than 40 peer-reviewed and conference papers on unconventional reservoir evaluation and optimization.

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TECHNICAL WEBINAR

presented by
Farhad Qanbari, ARC Resources

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****pre-registration is mandatory****
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