

GeoConvention 2024 (Calgary) Technical Paper Abstract

Title

A Clearwater Multilateral Well Case Study: Reviewing Diminishing Normalized Productivity Relative to Aggregate Lateral Lengths

Objectives/Scope

The Clearwater heavy oil play in Alberta, Canada, is one of the premier economical oil plays in North America with production rising from 2014 inception to approximately 120,000 barrels of oil per day and growing. Favorable economics are due to: shallow depth (< 1000m TVD), conventional reservoir characteristics, and low-cost open hole multilateral horizontal well designs that do not require costly fracture stimulations or thermal intervention. Completion designs have progressed to greater than 30 legs and over 48,000 meters of aggregate lateral length, and the impacts to initial and long term well productivity and ultimate recover is critical to understand. We will investigate production metrics by per-unit lateral length, and explore the impact of wellbore design/spacing and number of laterals.

Methods/Procedures/Process

- 1) Collect public data from the Alberta Energy Regulator (AER): well attributes, historical production, drilling and completions, and directional surveys.
- 2) Incorporate auxiliary AER data for multilateral wells with greater than 9 legs. AER data for drilling events greater than 09 is limited, which challenges data collection and analysis.
- 3) Calculate aggregate drilled and lateral lengths for each multilateral well.
- 4) Employ analytical and machine learning techniques to correlate production metrics normalized to total lateral length. Metrics to include IP90 oil rate and 3- to 18-month cumulative production.
- 5) Investigate correlations against well-related attributes, including well design, wellbore-spacing, TVD, and MD.

Results/Observations/Conclusions

- 1) Explore incremental production returns with respect to total lateral length against performance parameters.
- 2) Leverage predictive analytical forecasts to investigate how per-unit total lateral length impacts 10-year oil EURs.

We anticipate that a point of diminishing incremental production returns will be identified as the total lateral length of a multilateral well increases. We also hypothesize that an ideal total lateral length exposed to the reservoir can be correlated against various well design parameters including number of laterals and lateral spacing.

Applications/Significance/Novelty

A study of this nature has yet to be published. We feel that the results of this study will enable operators who develop Clearwater assets, or other multilateral shallow oil plays, better understand how many legs can be economically drilled, at what spacing, at what total lateral length, and with which well design in order to optimize production and maximize capital expenditures.

Standard methods of productivity analysis have been challenging due to the unique multilateral design and current limitations in the availability and completeness of data.