

Utilization of Seismic Inversion to Investigate Calcite Streaks in the Southern Clearwater

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Summary

Operational activity in the Clearwater formation has increased since 2017. The profitability of these operations primarily depends on multilateral well drilling. However, the formation presents challenges due to calcite precipitations within the reservoir. These calcite deposits reduce the drill bit's rate of penetration, increase capital expenditure, and decrease the porosity of the pay zone. As a result, well productivity is negatively impacted.

Additionally, during geo-steering, the presence of these harder calcite-rich zones can deflect the drill bit out of the target zone. Well-log data indicates that calcite streaks are characterized by higher compressional velocity and density measurements, whereas productive sands exhibit slower compressional velocity and lower density. This contrast suggests that acoustic impedance could serve as a useful proxy for mapping zones within the reservoir that are more susceptible to calcite streaks.

In this study, we utilized a 1988 2D reflection seismic line that has been reprocessed to be AVO compliant. Well-log data was also incorporated to better understand the thickness distribution of calcite streaks within the study area. The AVO dataset provides reliable quality data only at near angles, allowing for the accurate inversion of acoustic impedance. Our observations show a correlation between acoustic impedance values and areas where multilateral well pads have encountered greater challenges related to calcite.

Overall, the findings suggest that acoustic impedance can be a valuable tool in predicting the distribution of calcite streaks within the Clearwater formation, potentially aiding in better well planning and operational efficiency.