

Reservoir Parameters in the Wilrich Member of the Spirit River Formation

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Abstract

Proper evaluation of OGIP in the Spirit River Formation has been challenging for many years. Discrepancies between well performance, and log evaluations has led to animated discussions around porosity cutoffs, water saturations, and other reservoir parameters. Understanding OGIP is crucial to reserves, proper well spacing, delineating sweet spots, and overall development strategy. In recent years, increasing amounts of core have been recovered, especially in the Wilrich member. In addition to routine core analysis, many of the core analyses have included water saturations from Dean Stark analysis; some have also included Special Core Analysis, and Petrography. With the cumulative core data, it is now possible to do some quantitative or semi-quantitative comparisons, and place tighter constraints on some of the parameters used for evaluation. This presentation looks at the available data and the insights derived from the data.

The key observations are:

- Density sandstone porosity logs underestimate porosity by 2-3 porosity units.
- Dean Stark measured water saturations in reservoir sands are 20-25%.
- Mercury capillary pressure derived water saturations (converted to Air/Brine) are consistent with the Dean Stark measured values at the existing reservoir over pressures.
- Connate water salinity is probably 150,000+ mg/L NaCl equivalent.

Using input values consistent with the above, the Archie Shaly Sandstone and the Archie Average Sandstone equations did the best job at minimizing the difference between measured Dean Stark Sw values, and calculated Sw values among different petrophysical equations. Using the parameters above, Phi-H is more than twice what might otherwise be calculated using more conventional parameters.