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Log Analysis of Mannville Lithic Reservoirs – An Innovative Approach

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Summary

The Upper Mannville Lithic Play is an emerging play in Alberta believed to contain considerable resource in place. Despite the long-standing recognition that this interval is often hydrocarbon charged, prior to horizontal drilling and multi-stage fracking, it was widely regarded as non-reservoir rock. With horizontal drilling and multi-stage completions now being common place, these strata are now being exploited as reservoir in Southern Alberta. As extensive drilling of this developing play is anticipated, the authors attempt to employ an innovative method to refine petrophysical models in this reservoir.

The historical opinion was that these strata are not reservoir quality and often led to limited core testing on these clay-rich feldspathic strata. As a result, cored wells often lack a complete suite of laboratory analysis to constrain petrophysical models. Core porosity may have been tested in historical cores but water saturation and electrical properties were rarely tested. Since these historical cores are now subject to desiccation, accurate assessment of these properties from existing cores is not possible. Additionally, quantitative mineralogy data was rarely acquired. Thus, water saturation and mineralogy data to restrain models are sparse to non-existent. As may be expected, these data also lack modern logs such as Nuclear Magnetic Resonance or Elemental Capture Spectroscopy logs. So an innovation is in order to assist in validating the deterministic model.

To develop a cost-effective method to constrain the deterministic model, an innovative approach is explored. Conventional Volume of Shale petrophysics are performed on a subject well. Statistical clustering methods are then applied to include Nuclear Magnetic Resonance and Elemental Capture Spectroscopy logs run in this horizon in an offset well. These clusters are used to predict curves that lead to water saturation and clay content in the subject well. These predicted curves are then compared to the water saturation and clay content calculated in the Volume of Shale model. The relative merits of each method are discussed.