Unraveling the Complexity of the Low-Resistivity Pay Zones in the Natih Formation

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Abstract

Low resistivity pay (LRP) zones present a significant challenge in reservoir characterization due to their true resistivity (RT) closely resembling that of the adjacent water zones. In many cases, LRP zones exhibit resistivities ranging from 10 to 30 ohm.m, but the Natih Formation defies convention, with resistivities measuring less than 1 ohm.m. This unique behavior arises from a complex interplay of geological factors, including fine-grained sediments leading to microporosity and the presence of thin-bedded layers.

Exploring petrophysical challenges in LRP zones, the focus centers on a particular exploration well. Wireline logs reveal hydrocarbon saturations (SH) spanning from 30% to 40%. The extremely low resistivity of the target zone complicates the differentiation between hydrocarbons and water. In addition, the Archie parameters, including the saturation exponent (n) and the cementation exponent (m), introduce more uncertainties in calculating SH. Water resistivity (RW) has a value of 0.06 ohm.m at 77°F. Despite the high calculated water saturation (SW), rigorous testing efforts have yielded valuable insights, with high production rates of oil and very low water cut. In this work, we explore the complex nature of LRP zones in the context of the Natih Formation offering valuable insights into reservoir characterization and production optimization in challenging low-resistivity environments.