

Integrated Gas and Oil Zone Evaluation using NMR, Conventional, and Mud Gas Logging Data – A Norwegian Logging-While-Drilling Case History

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The presence of gas and light oil in hydrocarbon reservoirs has a distinct effect on commonly used porosity logging measurements such as density, neutron, and nuclear magnetic resonance (NMR). In case of changes in hydrocarbon composition along the wellbore, it can be difficult to compensate for gas and light oil effects resulting in inaccurate estimates of true formation porosity and saturation. Variations in lithology further complicate the usage of bulk density and neutron porosity. A new method for improved estimation of formation volumetrics is presented, combining lithology-independent NMR porosity log data with hydrocarbon compositional information from surface logging mud gas data. The discussion includes introducing bulk density as well as potential complicating effects such as invasion, variations in mineralogy, and the limited vertical resolution of mud gas data. Data from two wells drilled across gas, oil, and water intervals in a North Sea clastic reservoir illustrate the determination of a continuous HI log and the resulting improvements for porosity and saturation estimates.

