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Petrophysical Techniques for Asset Analysis on the North Slope

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ABSTRACT

Three things that factor into proving the value of an oil and gas asset are whether or not that asset consists of quality acreage, is accompanied by a solid analysis, and has available producible reserves. By utilizing petrophysical data, insight can be gained into where an asset holds its current value, and how much potential it may have for future further development. The stratigraphic focus of this investigation is the Shublik Formation, the lower part of the Jurassic (Kingak Shale), and the Cretaceous Brookian Shale. By utilizing petrophysical models, log calculations, and cross plotting methods, with available well and log data spanning the North Slope, an accurate assessment of the hydrocarbon potential, and key reservoir characteristics of the area can be made. Considering a series of assumptions delineated from previous research methods, (1)organic-rich sediments have a higher resistivity than organic-lean sediments, (2)organic-rich rocks decrease in sonic transit time and increase in resistivity, and (3)organic-rich rocks can have a higher gamma-ray reading than ordinary shale and limestone. Keeping these assumptions in mind, the total organic carbon (TOC) of formations throughout this area can be isolated using log calculations and cross plotting techniques, focused on a modified Î” log R method that incorporates sonic vs. resistivity data. Petrophysical log curves for porosity, volume of shale, permeability, and water saturation are then calculated and generated from available log curve data, to further indicate the potential of this area. These log curves are utilized in a zone attribute analysis to calculate the water saturation and porosity at each formation. Utilizing the modified Î” log R method, the logs for wells in this area indicate that the shale benches appear to have good TOC, and therefore, are prospective for hydrocarbon production. Attribute maps of generated porosity and water saturation values throughout the area show an increase in porosity with each subsequent formation and variable water saturation throughout each zone, displaying fluid distribution trends. Further analysis of petrophysical log curve data incorporated into area cross sections highlights geological complexities and potential pay zones.