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Petrophysical characterization and oil potentialities of unconventional resource development by utilizing physics of well log analysis and delta log R technique

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Looking at a formation as a source rock, then turning around and considering it a viable reservoir requires you to be able to shift your thinking and to analyze a great deal of data in a new way. If you don't, you risk not understanding the nature of "sweet spots". Method and/or theory of petrophysical well log and formation micro-imager data (FMI) were integrated in an analysis of the reservoir characteristics. The study essentially determined reservoir properties such as lithology, shale volume, porosity (Φ), permeability (K), fluid saturation, and net pay thickness. Shale volume (Vsh) was calculated by CGR instead of total GR due to influence of organic matter and uranium concentration. Log interpretation indicated porosity in the eight-20 PU range by using neutron & density model, as well as movable hydrocarbons. The well was tested and produced oil at a fair rate. The methodology of Passey et al. (1990) was used for delta log R calculation of TOC and involved overlay and base-lining of the resistivity and sonic logs and consideration of thermal maturity patterns. □logR technique is proposed by EXXON and ESSO company (Passey, 1990) which employs the overlaying of porosity logs (sonic, density and neutron) in arithmetic coordinate and resistivity log in logarithmic coordinate with fixed superposition coefficient to identify and calculate TOC. With the appropriate baseline, we can calculate the □logR distribution to establish the quantitative interpretation relationship between TOC and □logR. Best calibration was made using the available data such as image logs and □logR technique through wire line logs. An old well was drilled on the same structure and exhibited the same characteristics (shows, logs). We concluded that these source rocks are found to be highly productive reservoirs themselves, exhibit very good porosity and fracture network. They give low and high productivity in some intervals according production logging tool (PLT). High geothermal gradient caused maturation of these formations. Uranium content masked the total GR response, so spectral GR logs (SGR) should be highly recommended in unconventional resources to evaluate the clay content. □logR technique reflects mature source rocks with excellent quality; TOC is in the range of 2-9%, and matching with production.