

Nmr Logging and Interpretation In Tar Sands

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ABSTRACT

Standard formation evaluation in tar sands presents unique challenges due to the uncertainties of the formation water salinities and electrical reservoir parameters. NMR logging and interpretation was expected to overcome some of these difficulties since this measurement is practically independent of R_w and reservoir electrical properties. NMR logs are expected to be insensitive to the bitumen component in the porous space due to its high viscosity. Therefore the difference between density derived porosity and NMR derived porosity should result in bitumen filled porosity. Our experience indicates that this simple method seriously underestimates oil saturations in the reservoir. Measurements with two different NMR logging tools in a variety of areas indicated similar results. The analysis of NMR spectra suggests excessive volume of free water relative to core measurements (Dean-Stark). It is proposed that the NMR data is significantly influenced by the invasion near the borehole. Comparison of the downhole NMR data with the laboratory NMR on core samples corroborates this conclusion.

In zones of irreducible water saturation it is possible to correct for the effects of invasion on NMR logs and calculate accurate oil saturations based on NMR data and density logs. Intervals of movable free water can be identified by a substantial increase of the NMR derived free water saturation.