

Oil Sands Bitumen Estimation's Reality

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Summary

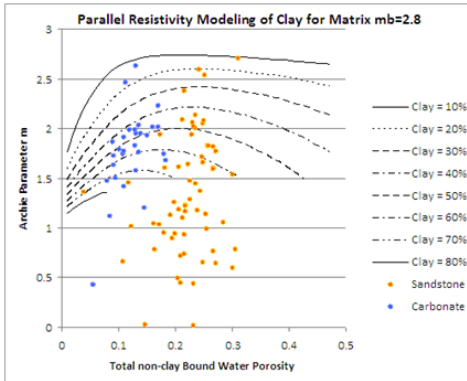
The early Cretaceous McMurray Formation is an example of fluvial to estuarine sedimentation. It contains large deposits of bitumen of viscosities reaching to more than a million centipoise. The formation is composed of loose grains with negligible cement. The grain size varies from very fine to conglomeratic sand. The clay minerals content varies as well, and it forms silty to muddy layers.

The variation of grain size, lack of cement and presence of clay minerals requires revisiting the fundamentals of the Archie equation to estimate the water saturation in pores based on the measured resistivity.

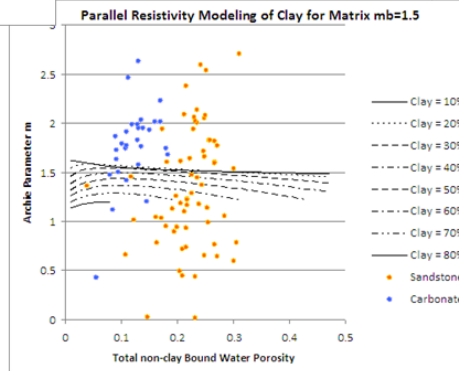
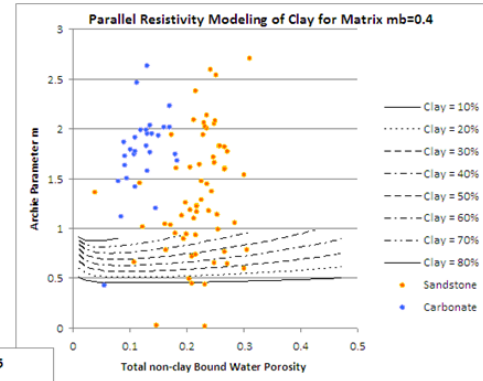
In this presentation, the Archie equation parameters are investigated and their suitability for McMurray oil sands is examined. In addition, a new model is derived based on Archie's equation, and comparison with core data is presented.

Other logging industry technologies, like permittivity and nuclear magnetic resonance measurements, are investigated and errors are compared.

Shaly Archie



$$m = \frac{\log\left[(1-V_{cl})^{1-mb} \phi_t^{mb} + (V_{cl} \phi_{BTR})\right]}{\log[\phi_t + \phi_{BTR}]}$$



102 data set out of 98 wells throughout the Mexican Republic.

Data comprises of very wide range of geological ages from Miocene to Pennsylvanian and includes shaly sands and some fractured carbonates.

The parallel resistivity modeling explains well all measured data.

Particle size distribution of clean sand or pore throat distribution for carbonates needs to be investigated to explain the need to vary the matrix pore tortuosity index (mb).

Data Source: ORLANDO GOMEZ-RIVERO, "A PRACTICAL METHOD FOR DETERMINING CEMENTATION EXPONENTS AND SOME OTHER PARAMETERS AS AN AID IN WELL LOG ANALYSIS", *The Log Analyst*, October-1976.

After the new shaly Archie is established, the limits of the Archie equation are investigated. This is done with comparison of core analyses available for oil sands.

This work has concluded that understanding the physical meaning of each Archie parameter applied on a loose material, like oil sands is essential to understanding the limits of log derived resources calculations. In addition, the log derived estimations are compared with core derived values to understand the best economical solution.