

Connectivity Theory - A method for Shaly Sand Correction for estimating Gas Hydrate Saturation

Abstract

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So called Archie rocks are characterized by a resistivity index (RI) versus water saturation that plots a straight line on log-log scale. All rocks for which the RI has curvature qualify as non Archie rocks.

Estimating the amount of conductive and nonconductive constituents in the pore space of sediments by using electrical resistivity logs generally loses accuracy where clays are present in the reservoir. Many different methods and clay models have been proposed to account for the conductivity of clay (termed the shaly-sand correction). In this study, the connectivity equation (CE), which is a new approach to model non-Archie rocks, is used to correct for the clay effect.

The CE presented here requires no parameters other than an adjustable constant, which can be derived from the resistivity of water-saturated sediments. The new approach was applied to estimate water saturation of laboratory data and to estimate gas hydrate saturations at the Mount Elbert well on the Alaska North Slope. Although not as accurate as the Waxman and Smits method to estimate water saturations for the laboratory measurements, gas hydrate saturations estimated at the Mount Elbert well using the proposed CE are comparable to estimates from the Waxman and Smits method. Considering its simplicity, it has high potential to be used to account for the clay effect on electrical resistivity measurement in other systems

References

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