AN ANALYSIS OF PARAMETERS INFLUENCING POROSITY AND PERMEABILITY OF TIGHT GAS SANDSTONES IN COOK INLET AREA, ALASKA

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The overall objective of this research is to develop reservoir models with petrophysical data, representative of Kenai Group of tight gas sands of the Cook Inlet area in Alaska in order to study viable and alternate technologies that may be deployed to access tight gas. These technologies include hydraulic fracturing and Maximum Reservoir Contact (MRC) or fishbone wells. As a first step, we analyzed the parameters influencing the porosity and permeability (P&P) of tight gas sands of the Cook Inlet region based on the petrographic data published by the Division of Geological & Geophysical Surveys, Alaska in 2007. From this analysis we developed suitable P&P correlations for the tight gas sands of the region. Eighteen parameters were reviewed for their influence on P&P of the Sterling, Beluga, Tyonek and Hemlock formations. The available sandstone sample (33 samples) data were first divided into cemented and non-cemented rock categories. The parameters that control the P&P of these two categories were analyzed separately. Non-cemented sample data showed significant correlation between porosity, permeability, depth, quartz content, lithic content , macropore, mesopore and micropore fraction. It was evident that P&P of non-cemented sandstone was directly controlled by mechanical compaction. A decrease in macro- and mesopore fraction with a concurrent increase in micropore fraction was observed with an increase in the depth of the formation. Non-cemented samples were further divided statistically into two categories viz. "very fine to fine" and "fine medium to medium". The parameters that controlled the P&P of these two statistically different data were analyzed with the help of scatter plots and bivariate analyses. Linear regression method was used and significant P&P correlations were obtained. P&P in cemented samples depended additionally on the timing of cementation and intensity of cementation. This petrophysical study may assist in predicting the most effective tight gas reservoir completion technology for this region.