

Calculation of Petrophysical Properties for an Iraqi Gas Field

Abstract

Reservoir characterization methods are valuable as they provide a better description of the storage and flow capacities of a petroleum reservoir. Carbonate reservoirs show challenges to engineers to characterize because of their tendency to be tight and generally heterogeneous due to depositional and diagenetic processes. The extreme petrophysical heterogeneity found in carbonate reservoirs is demonstrated by the wide variability observed especially in porosity-permeability cross plots of core data analysis.

The study reservoir is Lower Miocene age of Tertiary era in the north of Iraq which includes Jribe, Dihban, Euphrates, and Bajwan formations.

This work consists of two parts the first one is well logs analysis which involves determination of Archie petrophysical parameters, clay parameters (by M-N crossplots). Some interpretation and crossplots are done by Interactive Petrophysics (IP) software. The interpretation also includes determination of clay volume and water saturation by different methods. The second part includes permeability estimation by either direct calculation from empirical equations or by permeability correlation with petrophysical measurements. The correlation is done statistically by multiple variable regression and alternative conditional expectation (ACE) technique to find the best relationship for permeability with petrophysical characteristics to estimate permeability in uncored sections. ACE gave best relationship especially when multi independent variables used (group of logs). This part also includes determination of cutoff porosity by two methods; from formation evaluation and core analysis. It is concluded that the studied reservoir contains fractures.

The final stage of this work is spatial distribution of porosity and permeability which is done by generating contour map using Surfer software. These maps reflect the heterogeneity of the studied area. The areal variation of these properties shows that the permeability reaches maximum (12) md and minimum (0) md in Euphrates formation, while maximum permeability in Jribe is (2.73) md and minimum is (0.0173) md which indicates that Jribe is less heterogeneous.