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# Formation Evaluation by Multidimensional Petrophysical Correlations in Azerbaijan

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ABSTRACT

A multidimensional petrophysical correlation method for improving logging data interpretation was developed and applied on some oil and gas fields in Azerbaijan. This project utilized both petrophysical and core data from the upper three horizons of the Productivnaja Tolshcha formation, a series of unconsolidated sands, clays and sandstones of Neogene age between the depths of 1500 to 2000 meters. The reservoirs in this formation are characterized by porosity values of 18 to 30% and permeablilties of 20 to 800 md.

The suggested statistical method is based on constructed multidimensional correlations between directly measured well geophysical characteristics of rocks, and the actual formation rock properties including porosity, permeability and clay content, all of which were measured in the laboratory on about 500 recovered cores. The effect of formation temperature and pressure on the reservoir rock properties was also considered in the correlations.

The geophysical well log data were generally taken from a suite of logs including several electric resistivity devices with different radii of investigation, spontaneous potential (SP), gamma-ray, neutron and caliper. Special statistical criteria were used to estimate the representativity of the core data in cases of low percentage core recovery.

Multidimensional statistical correlations were prepared using regression analysis and presented in the form of algerbraic polynomials. Coefficients of the polynomials were calculated by the least squares method. The accuracy of the polynomials was measured by correlation coefficients. A comparison of the formation evaluation results obtained by multidimensional polynomials, with that obtained from core data in different petroleum reservoirs in several Azerbaijan fields is presented. Results of this comparison show that there is good agreement between the real and computer-derived data.

This correlation method effectively supplements the minimal geophysical logging data of many of the early wells of the Kura River region's oil and gas fields, and improves the well log interpretation.