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Correction of Induction and Laterolog Charts for Evaluation of Gas Reservoirs

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Abstract

One of the main parts of reservoir characterization is the estimation of porosity, lithology and water saturation. These are done in the pay zones by utilizing formation evaluation and logging tools consisting of sonic, resistivity, and radioactive logs. For this purpose, induction and laterolog charts in conjunction with the extent of conductivity of drilling fluid are used to decide whether Dual Induction Log (DIL) or Dual Laterolog (DLL) tools to be employed.

In numerous gas reservoirs of Iran, water-based drilling fluids with low conductivity (salinity) are used to drill these reservoirs. Based on existing literature, DIL is the logging tool of the choice for evaluation of these reservoirs. However, comparison of variety of DIL and DLL results showed that this is questionable and is not always the case. To clarify these differences, more logging jobs were closely studied.

It was observed that, regardless of the salinity of the drilling fluid, DLL gives better evaluations. This result is not in full agreement with the prediction of the reference DIL and DLL charts. Therefore, these charts need some modification. In this paper, the corrected charts developed from the field data which result in better predictions are given.

Employing new corrections causes the appropriate tools to be used. This results in lowering the number of logging tool runs and the rig time which both lead to reduction of costs and lowering the probability of stuck logging tools. Moreover, using these new charts helps to distinguish all oil and gas layers which may be missed if the previous procedure is used.

Introduction

Formation evaluation is one of the major tasks during constructing a well. This is usually done by service companies employing various techniques and tools. The factor that is usually considered in assessing the success of a new formation evaluation tool is the increased amount of oil or gas that is produced as a result of its application. If this amount is sufficiently large, the economics of providing the service by the service companies and the utilization of the service by the oil companies will both be satisfactory. Resistivity logs are used extensively in the oil industry for the determination of water-saturation profiles and, consequently, for the quantification of hydrocarbon originally in place (HOIP). They are strongly affected by environmental effects such as borehole, shoulder-bed resistivity contrasts, mud-filtrate invasion, dipping beds, and electrical anisotropy.[1,2] It is well known by log interpreters that