

WHAT IS R_t ? LOGGING-WHILE-DRILLING AND WIRELINE RESISTIVITY MEASUREMENTS SPOTLIGHTED: AN OFFSHORE CASE STUDY IN ABUDHABI

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ABSTRACT

Recent technology improvements in logging-while drilling (LWD) electromagnetic wave propagation resistivity devices have provided dramatic improvements in well-placement applications.

Azimuthal, deep-sensing measurements, coupled with other sensor measurements and significant software enhancements, have facilitated enhanced geosteering capabilities, which not only help maximize reservoir exposure, but also provide real-time updates of the local reservoir model.

However, LWD propagation resistivity measurements in highly deviated and horizontal holes can also present challenges to the analyst in answering fundamental questions in relation to formation evaluation. Typically, it is not only problematic to correlate LWD resistivities to offset vertical and/or pilot resistivity data, but it is also difficult to deduce true resistivity (R_t) and the flushed zone resistivity (R_{xo}), particularly in thin beds, from the numerous multi-frequency and multi-spacing measurements available.

This paper presents a case study from a thinly bedded offshore carbonate reservoir in Abu Dhabi. Two horizontal drains were drilled using LWD tools for the purposes of geosteering and formation evaluation. The available offset well data were from near-vertical wells, which were logged using wireline tools. The LWD propagation and laterolog resistivity measurements are compared to the offset wireline induction and laterolog resistivity measurements. Comparisons are also made between LWD propagation and laterolog resistivities acquired while drilling and while wiping after drilling. Differences between the various measurements are explored to identify the most appropriate choice of measurement in various circumstances. In light of the results, recommendations are made for data selection in future wells, with the intention of optimizing data acquisition practices for both well-placement and petrophysical evaluation.