

Geo-Steering with advanced LWD Technologies and Real-Time Management, Umm –Gudair Field, Kuwait

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Abstract

This paper discusses the various aspects and considerations of Well Planning and Geosteering operations to improve well productivity and reduce water cut effectiveness in the reservoir, which has been produced from Cretaceous Carbonate in Umm Gudair field, more precisely in B2 and B3 sub layers. The observed porosity ranges between 12-22% as well permeability ranges between 70 to 120 Md.

Advanced Geosteering methods have been used in order to provide high expertise Solutions in mitigating the geological uncertainties in structure and standoff from oil water contact along the planned well trajectory.

The LWD technology used in Real Time has been chosen in the pre-drill phase in accordance with the simulated synthetic logs for different LWD tools. Based on offset data, several images have been modeled and the real time images transmission were chosen accordingly.

As Gamma Ray and Density Images will not provide the expected response due to the reservoir characteristics, the resistivity images model showed that a clear response can be obtained in real time in order to identify and characterize the different sub layers of the reservoir layers with possible interpretation of transition zone before reaching to the current oil water contact.

The formation dips estimation while drilling can be determined from resistivity images, due to Interbedded B2 and B3 layers, clearly identified from the resistivity measurements, where Gamma Ray and Density has insignificant changes.

The early warning starts during Geosteering in B3 producing layer, where resistivity goes down to as low as 3 Ohm.m was indicating proximity to current oil water contact. The qualitative and quantitative signal interpretation collaborated with the two boundaries inversion of B2 and B3 layers in such particularly resistivity environment represents a real challenge for the team and was unknown to be used before. The decision is immediately taken to build inclination; exiting B3 layer and stay in B2 layer with a reasonable standoff from the aquifer despite of the excellent porosity (21%) of the layer.

New themes have been introduced and defined, such as Drilling, Geosteering and Geological target and shown the relation between them based on the LWD Technology used in Real Time Operations.