Derisking Complex Carbonate Reservoir Production by Evaluating Near Wellbore Area Using 3D Imaging Technique & Seismic Integration

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Abstract

Realistic geological characterization is crucial for the development of carbonate reservoirs especially to overcome some challenges related to Early Water Break Through (EWBT) like those observed in the Upper Cretaceous 'A' Formation. The complexity of the depositional, diagenetic and structural history created unpredictable connected pathway with the aquifer. Therefore, having suitable conceptual geological models tied to well data helps to better anticipate their occurrence and extension to plan for suitable well placement, a completion design, and optimize the production. The objective in this case study was to assess the Deep Shear Wave Imaging (DSWI) technology that can bridge the scales between well Borehole Image (BHI) and conventional Seismic to identify sub-seismic features up to 100ft away from the well bore. A statistical evaluation of the BHI was used as a reference for this DSWI assessment. Then the result was compared with Seismic coherency to assess the value of the combined data. This cross-discipline integration in 3D from different data measurements with a variety of scales by order of magnitude difference between them (Well and Seismic), has allowed to build a conceptual model of the near wellbore region up to 90ft and predict five significant fault zones from DSWI which could be divided into eleven zones on borehole imaging. These zones are susceptible of connecting with aquifer. Dynamic data will be used in the second phase of the project such as (liquid rate, water breakthrough and tracers) to analyze their contribution to the EWBT and refine/ enhance the interpretation. The way forward is to apply a similar workflow to other wells in the field, to gain a solid understanding of the sub-seismic architecture of the subsurface and hence timely optimize the setup of Inflow Control Device (ICD) design used to mitigate EWBT.