

Tight Reservoir Management Strategies During Well Testing; A Case Study from Kuwait

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ABSTRACT

Abstract Applying the latest available exploration technologies a critical wildcat well has been drilled over a double plunging anticline, targeting the Late-Jurassic Najmah Formation. On initial production testing of the upper limestone and kerogen units of Najmah Formation, the well yielded excellent initial oil and gas production rates with only 4% water cut. Subsequently the perforated zone was killed and the well was kept closed to make surface facilities to be able to connect the well to a Gathering Center. After connecting the well to surface facilities, it has been observed that the well did not show the production rates as expected following the well test. Instead hydrocarbon production rates reduced by around 90% water cut increased compared to the initial production rates. This paper will demonstrate the steps of our investigation that lead to an answer to this unusual drop in hydrocarbon production and future recommendations. At first, core data has been reviewed to assist the presence of natural fractures. This will help evaluate the possibility of early water break through the natural fracture network. This is followed by downhole pressure gage analyzed from the time of killing the well till putting it back on production. The third step was to build a geomechanical earth model to evaluate the killing pressures and compare these to the reservoir depletion. This will help understand the natural fractures critical stresses and calculate the well-kill pressure. The analysis concluded that the production is mainly through natural fractures and the consequent drop in pore pressure could reactivate the natural fracture and these in turn can connect to water bearing formations. The analysis found that during the well-kill operation, 3000 barrels of mud has been lost. This observation coupled with the stress model built, suggests that the reservoir has been fracked during the killing operation. This hydraulic artificial fracture connected the reservoir to the overlying water bearing Gotnia Formation resulting in the high water-cut. This analysis has been confirmed after water salinity sample analysis, which shows the water salinity matches that of Gotnia Formation water.