Re-Entry Challenges Addressed: Directional Drilling Technology Enables Novel Well Design to Cut Costs and Save Time in Kuwait

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ABSTRACT

With increasing pressure on oil and gas sector due to current market conditions, operators have to look for more innovative approaches to meet industry challenges. Re-entry wells help achieve higher return on investment in mature assets through minimizing top hole construction cost, and accelerating time to oil from existing wells where water coning issues are observed. This paper showcases the use of existing directional drilling technology to come out with an optimized trajectory design to reduce well construction costs and higher production in north Kuwait carbonate reservoir. Several existing vertical wells targeting a major clastic reservoir in North Kuwait were completed with 7" casing to surface. As the deeper reservoir became depleted, the need for re-entry horizontal wells targeting shallower reservoirs became the logical solution to address aggressive production targets. Regularly, such wells are drilled through exiting 7" casing and drilling the build/landing section to target entry point, then run an intermediate liner, and then drill the lateral 4.125" or 3.875" hole. History shows that drilling performance in such a slim hole size is significantly lower than similar 6.125” holes drilled in offset wells. After rigorous planning, design and modeling, a high build-rate conventional mud motor assembly was used to increase dogleg severity and output of directional BHA to deliver the planned trajectory with a casing exit point and target entry point within the same reservoir unit to address geological and trajectory challenges. The proposed system was run and managed to deliver the plan successfully. The optimized trajectory helped eliminate one casing size, and drill a combined 6.125” build and lateral sections in one go. For the first time, a build rate of up to 27 degrees per 100 feet was achieved in a well in Kuwait, and proved instrumental in achieving the optimized plan, pushing the old design criteria to newer limits. The paper will describe how the proposed BHA modifications managed to achieve the required high dogleg output and how supplementing the BHA with LWD measurements helped well placement. It will also highlight the realized gains and potential production improvement with the bigger reservoir hole size and how this capability enhances the project economics and enables increased production potential. Paper will ultimately show the cost and time savings realized using the new design over the older designs.