Strategic Application of Three-casing Perforation in Jurassic Well for Exploration of Cretaceous Formations Lead to Discovery of Oil and Saving Millions of Dollars for the First Time in Exploration in The State of Kuwait: Success Story

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Abstract

Objectives/Scope: The objective of this paper is to present successful application of three casing perforation in a Jurassic well for Exploration of Cretaceous formations, which was a great success, leading to discovery of oil and gas and saved millions of dollars by avoiding drilling another well for exploration of same formations in the field.

Methods, Procedures, Process: Deep exploratory wells are usually designed to target specific Jurassic formations. Each of these wells cost multi-million dollars for the drilling and the design is complicated due to the presence of high pressure zones in the middle of the well. The wells are designed for six casings and a liner. The targeted zones are exclusively Jurassic formations, with all targeted formations behind only one Casing / Liner. The paper refers to utilizing one of the unsuccessful Jurassic wells for testing cretaceous formations. This involves several compromises and was necessitated by drastic reduction in budget due to slow down during Covid-19. All the Jurassic formations were behind 10-3/4" Casing, 7-5/8" casing and 5" Liners. The testing results of Jurassic formations weren’t up to the expectations and the well was temporarily abandoned. The well was then studied for testing cretaceous formations in the well. The intended zones for testing were behind three thick casings, namely 7-5/8" 55.3#, 10-3/4" 73.2# and 13-5/8" 88.2#. Perforating the zones through these three thick casings was challenge, coupled with well integrity concerns. All Open hole logs and cement logs recorded earlier were reviewed for confirming the integrity of the well. Different service companies were requested to run simulations about formation penetration through these thick casings with different perforation guns and charges. After favorable simulation results the well test was planned with suitable Perforation and DST equipment.

Results, Observations, Conclusions: Application of three casing perforation is rare and perforation behind such thick casings is even harder to find worldwide. After the successful simulation the well was tested in three zones successfully, leading to discovery of oil and gas in hitherto unproven formations. All the zones were successfully perforated, confirming penetration into the formations and tested with DST test string. All the zones were successfully stimulated and produced oil and gas. This resulted in significant savings millions of dollars by avoiding drilling new well for these formations.

Novel/Additive Information: Strategic Exploration activity and successful application of three casing perforation were done saving millions of dollars and had discovery of Oil and gas for the first time in exploration in the State of Kuwait. This success opens doors for further utilizing the unsuccessful Jurassic wells for testing new shallower formations.