

## Early Field Development Challenges in an Unconventional Exploratory Carbonate Reservoir in Kuwait

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### ABSTRACT

In a first of its kind, an exploratory field in Kuwait was set with early field development and production targets. This is a very challenging objective for an exploratory field which at this early stage has limited geological and engineering data. Fast tracked production target was successfully achieved through a data-driven reservoir development and management approach based on suitable recommendations from an extensive data acquisition and integrated interpretation campaign. The reservoir is complex and characterized as a low permeability, multi-layered carbonate with spatial heterogeneity with a near critical reservoir fluid. An extensive reservoir data acquisition and interpretation campaign was carried out to verify the effectiveness of geological faults to act as flow barriers, reservoir limits, characterization of reservoir fluids, reservoir connectivity between wells and optimum choke sizes. Optimal stimulation techniques were planned and executed to improve well productivity to achieve the overall production target. All measurements and their interpretation were tailored to meet the timelines and stated production targets. Out of seven wells drilled, three wells which showed reservoir development were successfully tested and brought on production. An integrated analysis of the petrophysical interpretation along with the Pressure Transient Analysis of these three wells gave an understanding of production potential of the individual wells, layers and the existing heterogeneities in the reservoir. Analysis of individual short-term tests gave estimates of wellbore skin factors and helped in choosing candidates for well stimulation for production enhancement. Decision on specific stimulation type (matrix acidizing versus hydraulic fracturing) was done based on risk analysis. The integrated study ruled out the presence of individual smaller pools or discrete fracture networks in the reservoir and indicates the potential presence of stratigraphic traps. This study helped to successfully develop the field and meet production target in an exploratory scenario involving an unconventional heterogeneous carbonate reservoir with a near-critical reservoir fluid. This work serves as an example to propel early field development and production targets to become achievable objectives in unconventional exploratory fields despite their unique challenges.