Case Study

StackFRAC Titanium XV system leading the way for optimized field development of deep carbonate reservoirs

International, Kuwait
Titanium XV System

North Kuwait deep carbonate reservoirs are being developed to meet the majority of domestic gas demands, as well as production targets whilst maximizing long-term recovery. However, these reservoirs have been defined as some of the most difficult in the world, based on the petro-physical properties, and that most of the gas is existing in highly heterogeneous multi-layered tight and ultra-sour formations.

Challenge

Stimulation during the initial exploration phase of these reservoir intervals was done with conventional acid matrix stimulation of single bullhead treatments or using chemical diverters. Production logging tools in these wells showed that only about 10% of the total perforated intervals contributed to production, concluding that diverters were ineffective and a large proportion of the net pay within a well would remain unstimulated. The operator switched to a 4.5-in. cemented plug-and-perf completion for a period of time, where intensive well interventions were required to set and drill out plugs to selectively stimulate individual zones.

Solution

For two of their subsequent wells, the operator decided to install the field-proven ball-activated StackFRAC® Titanium® XV system in the Northern Kuwait Gas Development Area. The system was chosen as the most efficient completion strategy to increase productivity from the open hole through natural fractures and for the ability to provide proper reservoir management in case of unwanted fluid production. Without any intervention required during stimulation, the system would also save on the operational time and risk of wireline and coiled tubing interventions.

The system comprises a number of HPHT rated RockSEAL® H2 packers that were used to isolate individual or multiple flow zones. Drillable Closeable (DC) FracPORT™ sleeves were placed in each stage and isolated between the packers to enable selective testing and stimulating of each individual stage. Each sleeve was initially activated for stimulation by pumping incrementally larger balls from surface in a continuous pumping operation, with each subsequent ball providing isolation inside the liner from the stages further downhole. A shifting tool was provided to open or close the sleeves as desired after milling out the ball
Results

The StackFRAC Titanium XV completions were successfully deployed into two wells and set in oil-based mud (OBM) in a deep sour environment. The functionality of the Hydraulic FracPORT sleeve and ball-activated FracPORT sleeves in heavy OBM was successfully demonstrated—the stages were acid stimulated with flawless sequential opening.

The wells were flow tested with unmatched open hole isolation using RockSEAL H2 packers that saw downhole pressure on the order of 19,000 psi during stimulation. The ePLUS® Retina monitoring tool independently verified critical events such as packer setting and port opening. The feedback was valuable for both real-time confirmation and post-job processing.

The StackFRAC Titanium XV technology has enabled higher production performance due to better access to open hole natural fractures. Zones were tested and stimulated individually without the requirement for well intervention or milling of plugs with coiled tubing. By eliminating the risks of well intervention and reliance of good cement isolation behind the liner between completion intervals, the StackFRAC Titanium XV has efficiently reduced the cycle time between stages and made it possible to reach maximum well production potential earlier. Further HPHT multi-stage completions are planned by the operator to demonstrate the full potential of the completion method.

Packers Plus is the innovator of open hole multi-stage fracturing systems, providing field-proven and cost-effective methods for completing horizontal wells with superior production results in numerous formations around the world, including mature reservoirs.

Differences between bullhead treatment, plug-and-perf operations and open hole ball-activated sleeve operations; P = porosity, k = permeability

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