Case Study

Corrosion resistant HPHT solution delivered with StackFRAC Titanium XV open hole multi-stage ball-activated system

International, Oman
Titanium XV System

An operator working in a high stress complexity and heterogenerous reservoir in Oman wanted to trial an open hole system that could: (i) increase near wellbore conductivity (ii) reduce treating pressures (iii) work in an HPHT environment and (iv) add efficiency advantages. The operator implemented a 6-stage hybrid ball-activated sleeves/plug-and-perf solution with open hole stage isolation using the Packers Plus Titanium® XV StackFRAC® system. After the first three stages, test flowback production was so high that the operator decided to discontinue the remaining plug-and-perf stages.

Challenge

Wells in this field in Oman are typically completed using cemented plug-and-perf operations. Using this method, the operator had found that in some cases treatments could not be executed as designed because formation breakdown pressures were too high, even using high pressure/high temperature (HPHT) equipment rated above 10,000 psi (69 MPa).

The operator began exploring alternative strategies and wanted to assess two completion methdologies:
• The effectiveness of open hole completions in the formation
• The capability of ball-activated sliding sleeve technology
Early in the development phase of the field, the operator was looking for customized corrosion-resistant completion equipment with a focus on reliability. To help mitigate risk, it was required that some of the lower stages at the toe be ball-activated.

Solution

The HPHT tools ultimately selected for the completion were rated at 18,000 psi (124 MPa) maximum pressure and a temperature up to 375˚F. All 6 stages of the planned hybrid open hole completion used Titanium XV RockSEAL® H2 packers as the sole method of zonal isolation. Ball-activated Titanium XV FracPORT™ sleeves were used in stages 2 and 3 of the well for stimulation, while stage 1 and the upper stages utilized perforations to access and stimulate the reservoir.

After the design was agreed upon, the tools required for the completion were engineered, tested to maximum well conditions and validated in just 60 days before being shipped. The completion equipment was conceptualized, validated and manufactured to the desired temperature, working pressure and wellbore conditions in just over a year. This included initial design, analysis, testing, engineering and manufacturing to produce customized, corrosion-

resistant tools with temperature and pressure ratings exceeding those of the wellbore parameters.

Results

The system was successfully installed to a true vertical depth of 14,895 ft (4,540 m) and a measured depth of over 19,000 ft (5,791 m). Stage 1 was stimulated using tubing conveyed perforations, and the next two stages with ball-activated sleeves, using over 750,000 lb of proppant per stage, at an average rate of 45 bpm. The remaining upper stages were left unstimulated due to a higher than anticipated gas production rate from the first three stages. The operator observed a decrease in the number of operational issues and a reduction in average fracture breakdown pressure compared to using plug-and-perf completions.

6-stage open hole StackFRAC Titanium XV/plug-and-perf hybrid completion system used in first operator well

The operator followed this up with a second open hole 4-stage well completed using StackFRAC Titanium XV HPHT tools, where all the three stages following the toe stage were ball-activated. Both wells used the ePLUS® Retina monitoring system to verify downhole events, contributing to improved operational efficiencies. Tracer logs used for both wells also verified that effective fracture coverage was achieved using Titanium XV RockSEAL H2 packers.

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.