Record-breaking stage count: single multistage completion for an extended reach well

Middle East

Originally drilled in 1994, a vertical well in a tight carbonate formation was completed as a single producer in a green field. However, due to its significant distance from the Gathering Center (GC) and the reservoir's low productivity, the well was unable to sustain natural flow and remained shut in for over 15 years. It later experienced intermittent production before being shut in again for a sidetrack operation.

To maximize production potential, the well was converted from a vertical cased hole into a horizontal well. The primary objective was to optimize production from the main reservoir while also conducting an exploratory study in a secondary formation through a pilot hole. A Multi-Stage Fracturing (MSF) system was selected for completion to enhance recovery from the primary reservoir. The completion design incorporated multiple stages and flow compartments, determined using open hole logs, and included a 4.5-inch tubing string for the upper completion. To further boost production, the well was ultimately equipped with an Electric Submersible Pump (ESP).

CHALLENGE

The completion of the well presented several critical challenges that demanded innovative engineering solutions and meticulous planning.

One of the primary obstacles was the well's high dogleg severity (DLS), which ranged between 9-10 deg. per 100 feet. This extreme curvature made it particularly difficult to run the long Bottom Hole Assembly (BHA) through the whipstock, given the intricate trajectory required to reach the target zones.

Another significant challenge was managing the exceptionally long lateral section, which extended 6,700 feet. The presence of anticipated faults and highly fractured zones along this stretch added further complexity, necessitating the strategic placement of packers to ensure effective zonal isolation and maintain well integrity.

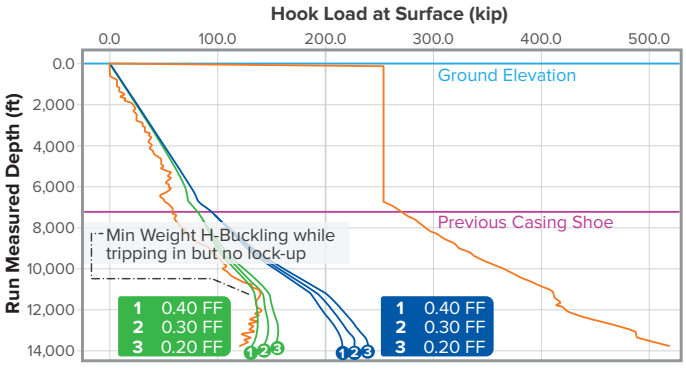
Competitors had previously struggled to complete wells under comparable conditions, often failing to deploy nearly half of the planned stages. As a result, they were forced to fall back on a cemented liner approach, limiting production potential and increasing the likelihood of intervention challenges near the well's toe section, where limited coil weight availability in extended-reach wells could restrict operational effectiveness.

This underscored the need for a robust and adaptable completion strategy—one that could overcome both geological and technical barriers to achieve a successful multistage completion where others had fallen short.

SOLUTION

The operator implemented a comprehensive completion strategy consisting of 27 fracturing stages and 2 blank stages. The blank stages were strategically incorporated to isolate highly fractured zones, ensuring better control over the acid fracturing process and reducing potential complications. For this operation, Packers Plus TuffSEAL™ Packers were selected due to their compact design—featuring a short length and minimal outside diameter—which minimized wellbore stress during deployment. These packers were particularly well-suited for the well's high dogleg severity (DLS), offering reliable sealing performance in challenging geological conditions.

Thorough planning was crucial to the success of this well. Detailed torque and drag analysis and tubing movement assessments were conducted to ensure operational integrity throughout the deployment process. Additionally, a Reamer Bottom Hole Assembly (BHA)—designed to mimic the stiffest section of the Multistage Completion (MSC) BHA—was used to drift the open hole before installation. This proactive approach helped optimize wellbore conditions, facilitating smooth deployment and reliable long-term performance of the completion system.



String Depth 13,800 ft, TOC 13,800 ft

Section Type	Length (ft)	MD (ft)	OD (in)	ID (in)
Drill Pipe	2,617.60	2,617.60	5.500	4.778
Heavy Weight Drill Pipe 1	1,800.00	4,417.60	5.500	3.250
Heavy Weight Drill Pipe 2	2,600.00	7,017.60	4.000	2.563
Wellbore E.	12.00	7,029.60	5.625	1,830

Graph shows the hook load while running in the hole with various Open Hole Friction Factors

Furthermore, the Packers Plus Debris Sub was utilized, providing a barrier to prevent debris from entering the lower completion during tie-back operations. The entire system was designed to leverage advanced Logging While Drilling (LWD) technology data for optimal stage placement.

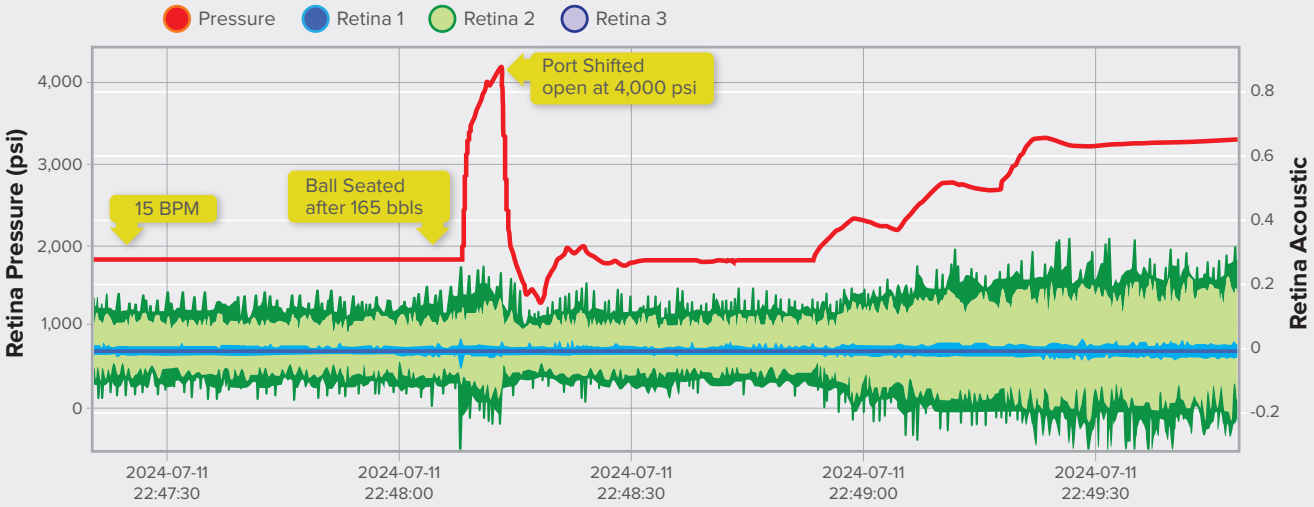
RESULTS

The successful execution of the 29-stage StackFRAC® system in the tight carbonate formation represented a major operational milestone. This project not only set a new record for the highest number of stages ever installed in the Middle East but also marked the largest multistage completion by Packers Plus outside of North America.

The completion system was deployed smoothly to the planned depth, demonstrating the effectiveness of the pre-planning and the robust design of the Packers Plus StackFRAC® system used. All FracPORT™ sleeves opened successfully, with no operational issues, demonstrating the reliability of the system under the well's complex geological conditions. This flawless execution was pivotal in maintaining the integrity and efficiency of the acid fracturing process, ensuring that each stage was completed as intended.

A key factor in this success was the ePLUS® Retina Monitoring System, which provided real-time confirmation of each FracPORT™ activation. Its instant feedback capability significantly enhanced operational confidence, streamlined decision-making, and minimized delays, allowing the team to transition efficiently between stages.

The project not only met its operational goals but also set a new standard for future jobs in challenging environments.



ePLUS Retina Chart for the Stage 8 DC FracPORT sleeve shift event using Retina Amplitude (blue line), Tubing Pressure (red line).

Packers Plus is a leading supplier of lower completion solutions, providing field-proven stimulation technology for horizontal wells with superior production results in numerous formations around the world. For more information about Packers Plus success stories and completion solutions, visit packersplus.com.