Case study: Gulf of Mexico

XACT service optimized complex liner hanger operational sequence to avoid NPT and save rig days

An operator working in the Gulf of Mexico wanted to save rig time by consolidating several runs via a liner hanger installation that included an inner workstring. The objective was to successfully and efficiently run the liner hanger to bottom while performing each stage of the innerstring operation. These activities would include setting the hanger and releasing the running tool, cementing, pumping displacing fluid, setting the packer, and performing a negative pressure test.

This complex operation would have a significant risk of non-productive time (NPT) especially since even conventional liner hanger installations are often challenging, especially in deep, deviated wells or in complex and unpredictable open hole environments. Because of this, many operators build multiple, costly contingency procedures into their liner hanger installation plans.

As an alternative to investing in significant equipment and hardware as part of contingency planning, Baker Hughes recommended the **XACT™ bi-directional acoustic telemetry service** for this application. Unlike mud pulse telemetry systems which are limited by wellbore flow conditions, the XACT service transmits digital data along the drill pipe via encoded sound waves so it can transmit data while tripping, running liners or even during cementing. This ensured the operator would have a clear, real-time understanding of the downhole environment during the liner installation and the innerstring operations—driving efficiencies safely and predictably.

A clear understanding of a complex operation

The application was challenging from the beginning. While tripping in hole, just outside the casing shoe, there was a tight spot that required washing and reaming to work past and continue to bottom. Because the XACT service was able to capture and transmit the downhole torque (~7.1 ft.klb) at the point of the setting tool, the operator was able to monitor for torque spikes and rotate the liner hanger with confidence and optimize the washing and reaming operations. Without the real-time data from the XACT service, the operator would have had to rely on the surface torque measurements (~20.9 ft.klb) and models. This would have likely resulted in a very cautious approach that limited RPM and extended the operation time.

The XACT service also provided real-time downhole pressure and monitored equivalent circulating density (ECD) to allow for higher circulation rates while ensuring the operator could stay within the desired pressure window. These same data transmitted by the XACT service were also used to identify fluid front during the cementing operation. This insight allowed the operator to enhance cement placement and control cement volumes to minimize packoff risks.

Setting the liner hanger represented a significant challenge due to the inner string's additional 100 kilopounds (klbf) and the fact that the setting procedure required slacking off the entire liner weight plus an additional 50 klbf at the running tool. The operation was

Challenges

- Deep and tortuous wellbore
- Innerstring assembly within the liner hanger adding complexity to weight at the running tool

Results

- Saved several hours in washing and reaming time and in negative testing
- Produced pressure results immediately for precise indication of when the bottom plug landed and when the plug was bumped
- Monitored fluid front for accurate cement volume placement
- Reduced rig time by approximately four days and saved the operator an estimated $700K USD

also complicated due to the hole's extreme depth (19,490 ft TD) and its 43° inclination. In previous attempts in offset wells using alternative methods, there was much confusion as to what weight was actually at the running tool. Real-time access to the downhole measurements eliminated the guesswork and the downhole pressure was used to confirm the casing test and to monitor the change in tubing/casing pressures during negative testing.

It is believed that several days of NPT were avoided thanks to the real-time downhole data available via the XACT. This included eliminating the risk of a potential misrun due to an inability to get the liner hanger system to bottom outside the first window as well as mitigating multiple issues that could have occurred during the setting sequence of the complex innerstring operation. In addition to NPT prevention, several hours were saved thanks to the highly efficient (~6 hour) washing and reaming operation while tripping in hole by optimizing the downhole torque. Typically, the operations can take days depending on the severity of the tight spot.

The customer was also able to save several hours by using the XACT service to obtain the negative test result. Due to the temperature change in the fluid of the drill pipe from bottom to surface, standard operations can take several hours to get the final pressure change.

The customer believed they were able to save an estimated three days of rig time, valued at $525,000 USD, and gain one day's worth of incremental efficiency ($175,000 USD) through the use of negative pressure testing.

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