Baker Hughes

Case study: Gulf of Mexico

XACT telemetry service continuously monitored fluid levels, and minimized reservoir damage in deepwater well

To minimize fluid losses and associated formation damage in an offshore deepwater well, a major operator needed to maintain optimum overbalance at the formation.

Conventional measurement techniques, such as echo meters, had proved problematic in accurately measuring riser fluid level, and in providing the real-time updates required to manage inflow proactively. Fast updates are particularly needed during perforation and acidization operations, when fluid levels need continuous monitoring. Additionally, any in-well tools had to be fullbore to allow the passage of wireline tools needed to operate a formation isolation valve.

Working with the operator, Baker Hughes recommended the **XACT™ bi-directional acoustic telemetry service**. With the XACT service it's possible to eliminate guesswork to get a clear, real-time understanding of the downhole environment—driving efficiencies safely and predictably in a variety of well activities from spud to well abandonment.

The XACT service transmits digital data along the drill pipe via encoded sound waves. This means it can be used effectively during tripping, completion installation, liner running, and cementing.

Eliminate guesswork from your operations

By using applied acoustics, you can get real-time downhole data from previously unavailable environments regardless of fluid, flow, formation, or depth, to more reliably and safely control fluid levels to minimize reservoir damage. Integrated measurement and acoustic telemetry nodes were positioned in the riser at 3,500 ft and 7,500 ft (1066 and 2286 m) below the rotary table. Bore and annulus pressure data, from both XACT tools, were acquired and displayed at surface to determine the top of the mud column relative to the rig floor, and hence the volume of mud above the tools. Downhole pressure data was transmitted every 25 seconds throughout the operation, enabling the operator to safely monitor the well through all operations, including tripping in and out of the well while the well was under losses. Continuous monitoring of downhole pressures allows hydrostatic barrier verification in situ, complying with all safety standards even while tripping in or out of the hole and enabling downhole pressure transmission even below closed BOPs. The XACT service was deployed both during the tubing conveyed perforating (TCP) gun run and the upper completion installation.

Make objective decisions

Knowing the position of the fluid top in real time allowed the operator to proactively manage the losses by maintaining the fluid level approximately 4,000 ft (1219 m) below the rotary table. This applied a known overbalance on the reservoir, which minimized loss rates and potential formation damage due to excessive overbalance and high loss rates. Continuous measurement enabled

Challenges

- Observe, control pressures downhole
- Minimize losses and avoid reservoir damage
- Control fluid levels several thousands of feet below rig floor to lower hydrostatic head

Results

- Provided downhole pressure data with a 98% telemetry uptime in real time during completion operations
- Minimized customer risk, improved efficiency of operations and avoided reservoir damage
- Satisfied all regulatory requirements for barrier control

timely adjustments as loss rates changed before and after perforation, and during the subsequent acid wash and mini-frac operations.

Comparison of the distributed measurements from the two XACT runs showed a partial blockage forming between the tools, identified as hydrate buildup. Fluid levels were then modified to increase pressure on the reservoir to minimize this effect, later removed by glycol prior to future operations.

The operator successfully engineered and safely completed an operation that would never have been attempted without the continuous fluid level monitoring provided by the XACT service.

As the annulus is filled, pressure increases on the reservoir and losses increase. When the fluid level drops, loss rates decrease. Real-time fluid level monitoring allowed the well to be in a controlled, balanced state maintaining a fixed overbalance to maintain safe barriers but minimize fluid loss and potential reservoir damage.

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