

Case study: Gulf of Mexico

xSight services enabled single-run casing exit on GOM floater, saved rig days and \$2 million USD

A major customer in the Gulf of Mexico (GOM) needed to execute a deepwater casing exit from a floating drillship. The objective was to set a whipstock and mill a window in 13 5/8-in. casing at 10,365 ft (3159 m). The casing was 88.2-lb/ft, Q-125 grade, in a well section with a 44° inclination. The window quality needed to be sufficiently high to pass well equipment through the window without remedial runs.

To achieve this, Baker Hughes recommended the **xSight™ analytics and optimization service for casing exits** to improve milling performance and window quality. Using this analytics-based casing exit service offers standardized—and optimized—downhole operating parameters. Pairing this approach with real-time downhole measurements during the operation allows the offshore supervisor and remote operations team to use data-driven decisions during milling—ensuring more predictable performance during casing exit operations and reliable superior window quality in a single-trip service.

Prior to this well, Baker Hughes had performed four casing exits in the field with the customer, and each required at least one polishing run. During those operations, however, engineers were able to gather valuable sets of downhole data. The xSight service analyzed the data from those offset wells to provide a roadmap for single-run window milling. Using a predictive and prescriptive analytics workflow

developed by Baker Hughes, the offset well information from the customer was integrated in the workflow to provide a recommended milling program, or roadmap, that specified surface rotational speeds (RPM) and a detailed downhole weight-on-bit (WOB) setting at incremental points along the length of the whipstock ramp.

It was believed that closely adhering to the roadmap should effectively reduce window drag and vibrations, increase milling speeds, and result in higher quality windows. As part of the xSight services deployed on this well, these advanced analytics were combined with real-time downhole measurements to ensure the application remained within the recommended operating envelope with accurate control, better decisions, and, when needed, effective corrective actions.

In addition, pairing the xSight service with a single-trip whipstock system with a full-drift outside diameter (OD) window mill saved significant rig time by eliminating at least two round trips with drillpipe. The whipstock system also included upper and lower window mills dressed with advanced milling technology cutters and a formation mill that enabled one-trip casing exit and rathole drilling.

The deepwater well included a 13 5/8-in. casing at a depth of 10,365 ft (3159 m) and real-time downhole data from the xSight service assisted the rig crew in avoiding a pre-set condition of the

Challenges

- Set whipstock at 10,365 ft (3159 m) and mill through 13 5/8-in, 88.2-lb/ft, and Q-125 grade casing in a single-run from a floating rig in the deepwater GOM environment
- Improve milling performance compared to offsets
- Pass bottomhole assembly (BHA) through casing window on first attempt without additional milling/polishing runs

Results

- Set whipstock and milled window in a single run using recommended operating parameters from xSight service's prescriptive analytics models (i.e., surface RPM, downhole WOB)
- Achieved efficient single-run casing exit and 100-ft (30.4-m) rathole that allowed all subsequent drilling and well construction equipment to pass through unimpeded
- Improved milling performance compared to offsets
 - Required 30% less WOB to yield same milling time
 - Reduced torsional vibration by 17% with no stick-slip
 - Increased incremental ROP along the ramp by average of 30%
- Recorded zero HSE issues or nonproductive time (NPT)

whipstock by carefully monitoring and managing downhole WOB. The xSight service's real-time measurements also provided downhole orientation to ensure the whipstock was set at the correct angle.

Leveraging the xSight service's milling roadmap and real-time data, Baker Hughes milled the window safely (no health, safety and environmental (HSE) incidents) and efficiently with a 30% reduction in WOB in the same amount of time as previous runs. At incremental points along the whipstock, the average rate of penetration (ROP) increased by 30%. Tangential vibration was reduced by 17%, and the window drag was reduced by 50%. And, after the milling operation, mills were shown to be less than 1/8-in. undergauge indicating a successful, full-gauge window. The subsequent drilling and well construction equipment passed

through the casing window successfully with minimum drag.

The improvements resulted in a reduction by an average of two additional runs compared to the offset casing exits. This reduction equated to a savings of more than \$2 million USD in rig time for the customer.