



New Approach Enables Operator to Determine Successful Completion Operation

REAL-TIME DOWNHOLE WEIGHT-ON-BIT AND TORQUE-ON-BIT MEASUREMENTS MITIGATES RISKS TO ENSURE A SUCCESSFUL COMPLETION STRING DEPLOYMENT

GULF OF MEXICO

CHALLENGES

- » Determine wellbore conditions without running gyro survey service
- » Find the cause of observed low torque in the last hole section to determine whether a planned well completion would be successful

SOLUTION

- » DrillDOC® tool was recommended to obtain real-time measurements of weight and torque, which were utilized to compare the forces applied at the surface with the measured forces in the BHA

RESULTS

- » By monitoring the DrillDOC measurements, the operator had confidence that the torque and weight on the BHA were sufficient to successfully deploy the completion string

OVERVIEW

In a deepwater (water depth over 4,000 ft (1,219 m)) Gulf of Mexico subsalt wellbore, an operator sought to run its completion string in a very challenging environment. The upper borehole section had undesired tortuosity and high dogleg severity that had caused operational difficulties in the past. While running the completion string to bottom, it was difficult to monitor the mechanical force on the casing downhole and to have the ability to respond to changes without the use of downhole weight and torque measurements. The operator elected to utilize a downhole sensor system that monitored real-time weight-on-bit (WOB) and torque-on-bit (TOB) measurements to ensure that the string was deployed within the borehole mechanical limits for a successful completion operation.

OPERATOR SEEKS SOLUTION TO HAVE MORE CONFIDENCE IN DETERMINING SUCCESSFUL COMPLETIONS

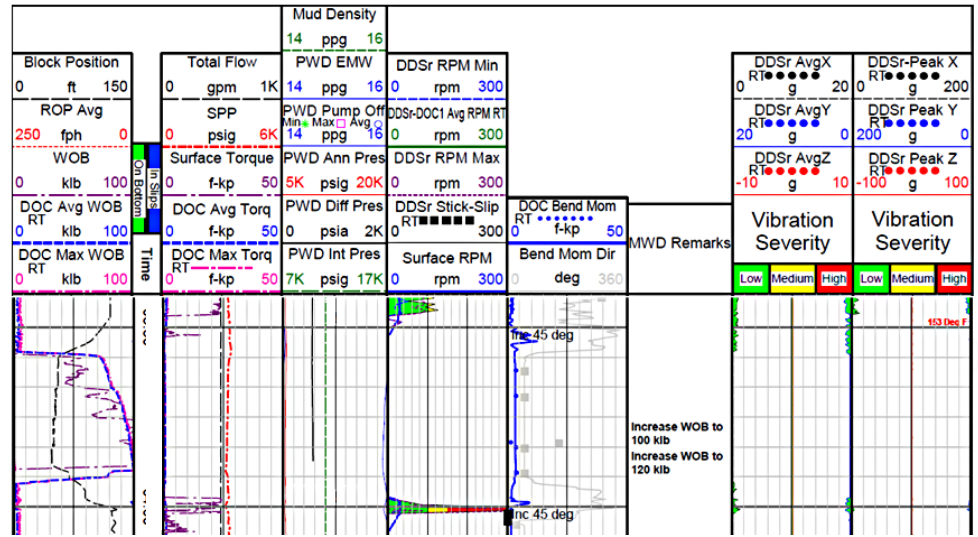
In previous wellbores, the operator had problems getting its completion string to the bottom efficiently due to suspected wellbore tortuosity and undesired dogleg severity. This typically occurred in the upper borehole sections. It was noted in these sections that excessive WOB transfer had caused surface torque to exceed the drillpipe makeup torque, both of which are key factors in determining successful wellbore completion string deployment. Utilizing conservative values for friction factors, the standard torque and drag models determined that the operator would exceed the makeup torque specifications for the drillpipe. Through careful secondary analysis, the friction factors were adjusted and the makeup torque specifications were held within their limitations. The operator requested a validation method to ensure successful completion string deployment. Sperry Drilling was requested to provide real-time measurement solutions that would assure successful completion operations.

DRILLDOC™ SERVICE PROVIDES REAL-TIME DOWNHOLE MECHANICAL DATA TO PROPERLY DETERMINE WELLBORE CONDITIONS

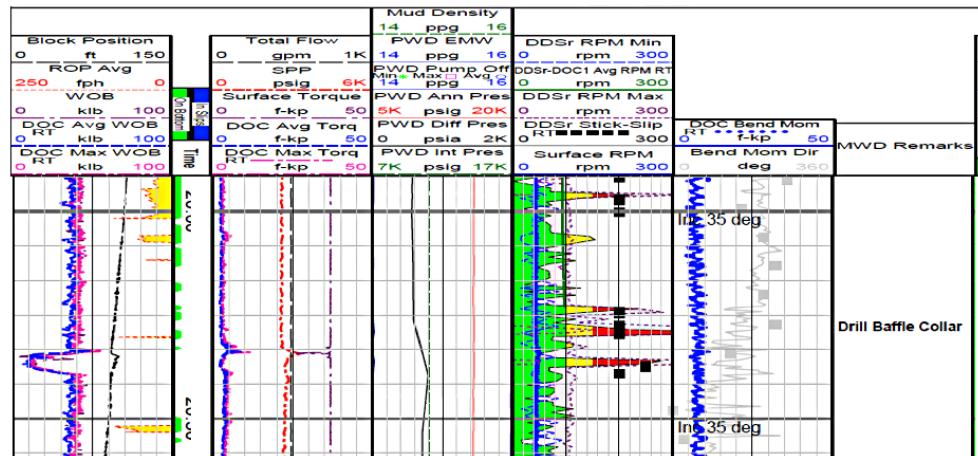
The Sperry Drilling team recommended the DrillDOC® drilling downhole optimization collar tool to provide real-time measurements of WOB, TOB, bending moment, and vibration to characterize the transfer of energy from the surface to the bit. This integration ensured that the full movement of the bottomhole assembly (BHA) was measured through all aspects of the cleanout run. Once these measurements were obtained, the operator would be able to compare the forces applied at the surface with the measured forces of the downhole BHA, and then can determine whether they were within the correct specifications to efficiently run the completion string as designed.

REAL-TIME DOWNHOLE MECHANICAL DATA MONITORING HELPS TO DETERMINE THAT THE COMPLETIONS STRING WAS NOT AT HIGH RISK TO DEPLOY TO BOTTOM

During the cleanout BHA run, the DrillDOC tool measured less bending moment or dogleg severity than what the surveys had indicated, alleviating the concerns of wellbore tortuosity for completing the well. Sperry Drilling analyzed and compared WOB downhole measurements to the surface measurements, resulting in 81 percent average weight transfer and demonstrating that this weight transfer was enough to deploy the packer during the completion operation. Moreover, the TOB measurement coincided with the torque and drag model, demonstrating that there was going to be enough torque that could be applied to successfully run the completion. With this new approach of analyzing these downhole measurements, the operator had higher confidence to continue running the completion, and the well is currently producing as planned.



In the cleanout BHA run, the DrillDOC® tool revealed good WOB transfer (top image) and TOB transfer (bottom image), resulting in higher confidence for successful completion string deployment.



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