Revolutionizing Drilling In Deep Gas Wells: A Comprehensive Approach To Reduce Formation Break Out

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Abstract
Objectives/Scope: During the drilling of some deep gas wells, there have been instances of a significant breakout in the formation and instability in the hole while drilling the 12.¼” section. This has led to high Non-Productive Time (NPT) and cost impacts of up to $2.0 million in some cases. In the worst cases, it has even compromised the well objectives. The objective of the PPS is to minimize the breakout issue by reducing back reaming by 50%, eliminating stuck events caused by breakout, and achieving primary log evaluation.

Methods, Procedures, Process: A practical problem-solving approach was adopted, consisting of 8 steps. The first step involved clarifying the problem by selecting 10 specific wells. Next, the problem was broken down into steps using IS/IS NOT analysis. Three main targets were then set as the goal to be achieved. The root causes were identified by applying Fishbone & 5 Whys analysis. Four counter measures were developed, followed by a pilot test in one of the newly drilled wells in the same area. The results were evaluated and measured against the set targets. Finally, the process was standardized to ensure future consistency.

Results, Observations, Conclusions: To address the issue, a set of countermeasures were developed and tested in a newly drilled well. The four countermeasures included drilling a 12 ¼” hole section with sufficient MW of 11.9-12 kPa/m, using oil-based mud to minimize breakout, avoiding fault corridors based on a thorough geomechanics study, and utilizing chemicals to enhance filter cake membrane and wellbore stability, based on a comprehensive drilling study. These measures were successful in achieving the set targets, with an improvement of 50% in open hole POOH, no stuck events reported, and all primary OH logs completed. The implementation of these measures led to cost avoidance of approximately $100k per well, with the potential for up to $2M in savings.

Novel/Additive Information: Promising results were observed during the pilot testing, and if replicated in deep gas wells, could significantly impact the drilling of problematic formations. Continuous monitoring of performance can further enhance hole stability. The application of this approach is not only beneficial for PDO but also for the oil and gas industry as it mitigates the impact of formation breakout. The successful resolution of this issue can be attributed to the thorough geomechanics and drilling fluid study conducted.