New Approach to Geomechanics Solves Serious Horizontal Drilling Problems in Challenging Unconventional Plays
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Summary

A new risk-based approach to geomechanics analysis, called ‘depth of failure,’ is having game-changing results and solving serious problems when constructing horizontal wells in troublesome unconventional shale plays. This approach combines technically sound engineering with drilling and geomechanics integration and provides a solution that is more valuable to the drilling community. This workflow is being implemented to allow complex wells to be drilled successfully, where failure had previously been a high risk.

Introduction

Typically, only reservoir quality and completion quality are considered when determining where to land a horizontal well in an unconventional reservoir. However, for some shale plays, this approach can result in severe and unmanageable wellbore instability problems when drilling the well. A new rapid mechanical earth model (rapid MEM) workflow has been developed that allows operators to make key decisions for their horizontal well, after having obtained necessary geological information in a pilot hole. The process is completed before the rig is ready to drill a lateral or sidetrack, so no rig time is lost. This new drilling geomechanics workflow combines several new innovations:

1. A risk-based approach is used that considers the mud weight needed versus wellbore collapse, which allows for better decision making.
2. A new method is used to calculate the level of failure within the wellbore if the bottomhole pressure is too low, either due to inadequate mud weight or swab. This calculation method, known as depth of failure, is tied to the above-mentioned risk of collapse.
3. All geomechanics analyses, whether hind-casting previous experience or projecting future plans, allows for dynamic loads such as equivalent circulating densities (ECDs), surge, and tripping swab.
4. An innovative method of presenting the rock mechanics for projected horizontal wells, accounts for the risk of geological and survey uncertainty. Previously, rock mechanics projected for horizontal intervals could be very misleading.
5. The workflow closely combines drilling engineering as well as geomechanics to ensure that the drilling customer gets a more focused and useful product. In particular, customers are presented with solutions to problems, rather than simply geomechanics curves.

By incorporating this new approach to geomechanics analysis, customers have been able to understand recent drilling failures, recognize the potential risks moving forward, and determine how to manage these risks. The outcome of this geomechanics analysis has been used to determine where and how to land a horizontal well, the safest mud weight to