First-Ever Application of Real-Time LWD Shear Sonic Velocity for Geomechanics in Slow Formations of Western Offshore Basin, India: A Game-Changer for Wellbore Stability in Exploration Wells

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ABSTRACT

Today with exploratory wells being drilled in increasingly difficult and complex terrain, the cost of exploration is only expected to rise. It is imperative to make use of advanced logging measurements available while drilling to understand and negotiate any forthcoming challenges that could adversely impact the well-program - be it kicks, losses, stuck pipes or time-dependent wellbore stability. The present available workflows follow a traditional approach and consist of a basic iterative Geomechanics model which fails to estimate the shear failure-mud weight limit of the formation required to keep the borehole stable. The pore pressure gradient and fracture gradient model is not able to explain the kicks and losses encountered while drilling. They also lack the required accuracy and resolution. The industry's first and only LWD real-time shear sonic data, available with quadrupole technology has enabled to build high accuracy and precision geomechanical models for efficient drilling of exploration wells and aid in taking important decisions in terms of wellbore stability and cost optimization. The availability of real time shear enables the selection of mud weight and casing depth. The ability to provide real time shear in all types of formations slowness ranges and mud types further enhances the value of the industry's only real time shear. ONGC's Western Offshore Basin asset, India attempted to assess the quality of LWD shear in the slow formations and study the application and usability of this data further in one of the exploration wells. Acquisition of high quality LWD sonic data (both compressional and shear), showed the high quality of real time shear sonic which was used in innovative workflows for drilling Geomechanics-related problems. This could also help in optimizing a workflow for safe and stable drilling of exploratory wells in challenging fields. The pore pressure profile showed a wide variation with depth and clearly establishes the need to vary the mud weight with depth and hence control the ECD before drilling ahead. This was the first-ever such application by anyone in India and the application and usability of this data was utilized further in one of the exploration wells.