EAGE

IR21

Role of Geomechanics in improving Field Development Strategy: A Case Study from North Kuwait

S. Perumalla* (Baker Hughes)

SUMMARY

The Lower Cretaceous Zubair formation in North Kuwait comprises oil-bearing sands intercalated with shale sequences. Historically, drilling into this formation presented major wellbore instability issues that include hole pack-off, stuck pipe and logging tools, high over-pull, tight zones while tripping, and severe hole washouts. These well problems have a significant impact on well costs and timeline.
Due to significant wellbore instability in these wells, the operator was drilling mostly vertical wells. However, surface constraints and production goals demanded placement of high angle/horizontal wells to maximize reservoir contact and higher production. The wells drilled in every orientation have experienced instability problems in this formation. Vertical wells have encountered major washouts and difficulties with wireline logging operations. Deviated wells have been even more unstable and often required sidetracks - greatly increasing well costs.
This presentation analyzes these wellbore instability problems, including the failure mechanisms, and presents the actions taken to resolve them. A solution to these instability issues is presented, which was derived by building geomechanical models using well data, drilling problem analysis, core inspection, and core -based rock mechanical test results.
We used chemoporoelastic and anisotropic geomechanical models to simulate the behavior of the Zubair formation while drilling in vertical and deviated holes to understand the wellbore instability experiences. Based on the analysis, changes in mud weight, reformulation of the mud system, and modified drilling practices were incorporated in the well plan of new high-angle wells. Success was achieved in drilling the wells and running the casing in this formation with deviations as high as 80°. The study helped to achieve a large reduction in indirect NPT due to wellbore instability. This experience is also a key learning and input for designing future complex trajectories. It was observed that a major measurable impact in the form of smoother operations and optimized well cost occurred during the drilling campaign based on recommendations from this analysis.
This presentation also discusses the way forward in optimizing well completion strategy, trajectory optimization for field development and positioning of wells for optimal reservoir. The ultimate goal of implementing Geomechanics in field development is to help decision support to enhance the production at well scale and field scale with optimal balance between injection and production strategies.