

FriDEEP50

Addressing Geomechanical Challenges in Carbonate Reservoirs via Operational Guidelines for Offshore Gulf of Mexico

J. Almeida* (Baker Hughes), J. Cornielis (Baker Hughes), C. Castañon (Baker Hughes), M. Rangel (Baker Hughes)

Summary

Carbonate reservoirs hold a significant portion of the world's oil reserves (approximately 75%), subsequently new conceivable techniques are needed to constantly evaluate and optimally develop these reservoirs successfully. However, these reservoirs present major challenges due to heterogeneity of rock properties, preexisting fracture networks, vugs and abrupt lithologic changes, making drilling operations more difficult than in most siliciclastic environments. These challenges are in part due to ineffectively attempting to utilize standard geomechanics and pore pressure prediction methods, which are not viable and not applicable for carbonates. Operations typically respond to well control, or tight hole events, without correctly identifying the root cause of the application. But responding incorrectly, will often worsen the conditions.

The main typical risks associated with carbonate environments are fluid losses (partial and total), water and gas influxes, and tight holes, which can lead to issues with well control, wireline logging, liner running and poor cementation. The best solution is one that produces predictable results from both technical and mechanical perspectives. The suggested approach demands proper collaboration between well construction engineers, drilling engineers, rig site staff, geomechanics experts and geoscientists.

The purpose of this paper is to provide operational guidelines, including downhole and surface technologies for successful drilling through carbonate environments. The guidelines are linked to real-time geomechanics and drilling services and are based on seismic interpretation, formation evaluation, and reservoir modeling solutions in order to create a uniquely integrated 3D modeling environment that facilitates inter-disciplinary workflows. The guidelines are designed to proactively utilize the information acquired from surface logging services (SLS), logging while drilling (LWD), wireline logging (WL), managed pressure drilling (MPD) and drilling parameters to predict what lies ahead and reduce risks during drilling, tripping, wireline logging, casing running and cementing operations. This paper will use real examples from the Gulf of Mexico 1) to explain the importance and benefits of using these guidelines to minimize the fluid loss volume and kicks in an HPHT carbonates environment and 2) how a full understanding of geomechanics in carbonate rocks and lessons learned can play a critical role in developing contingency plans to effectively manage losses and kicks when they occur.