

Case History

Optimized Pressure Drilling

GeoBalance® Managed Pressure Drilling Service Helps Save Rig Time in Fractured Granite

Location: Offshore, Southeast India

OPERATOR'S CHALLENGE – Discovered in the 1980s, the PY-1 field located in the offshore part of Southeast India tested with significant sweet gas in the basement reservoir of naturally fractured granite. However, conventional drilling of the horizontal development wells typically encountered frequent lost circulation and substantial formation damage that would lead to early termination of drilling. Additionally, frequent gas kicks resulted in high-risk well control situations, often requiring that drilling operations be terminated earlier than planned.

In particular, the 8 ½-inch hole lateral section proved difficult to support in the fractured formation, with well control and drilling problems increasing costs substantially. The operator sought a solution that would mitigate well control incidents and facilitate drilling of the critical production hole.

Due to the presence of natural fractures in the reservoir, Sperry Drilling services recommended using GeoBalance® automated managed pressure drilling (MPD) services to minimize loss of circulation and prevent formation damage.

Sperry's GeoBalance® automated MPD system technology helps manage bottomhole pressure (BHP) precisely between narrow margins of pore pressure and fracture gradient by the application of backpressure on the annulus at all times. The system is automated by the use of a real-time hydraulics model, which takes into account the real-time parameters and calculates



The GeoBalance® automated choke system helps to maintain a constant BHP during all drilling stages, rapidly adjusting BHP according to well conditions, whether moderate losses or small influxes.

the required backpressure to maintain bottomhole pressure during drilling, connections, tripping and well control situations.

HALLIBURTON'S SOLUTION – In today's era of "difficult oil", MPD has emerged as a boon for the industry to achieve targets that were previously limited by conventional drilling techniques, such as drilling in zones of natural fractures.

In this application, the fractured granite formation of the basement reservoir has an estimated pore pressure of 9.22 ppg, causing drilling difficulties, which often translated into high non-productive time (NPT) with associated cost increases. In addition, reservoir contamination from excessive mud losses and lost circulation material (LCM) treatments combined with the difficulty in drilling the planned horizontal section contributed to unsatisfactory production and reserves recovery.

The GeoBalance automated MPD system would make it possible to maintain a constant BHP during all drilling stages, rapidly adjusting BHP according to well conditions, whether moderate losses or small influxes.

In Well A2, the GeoBalance system made it possible to maintain equivalent circulating density (ECD) during drilling and connections. When losses required the mud weight to be revised, mud was displaced by sea water and a precise ECD was then held, thus avoiding any influxes or losses. As a result, a total of 762 meters (2,500 feet) of 8 ½-inch hole was successfully drilled to the target depth of 3,521 meters (11,552 feet) in 78.5 hours.

ECONOMIC VALUE CREATED – In this challenging fractured formation, the GeoBalance service helped in delivering a successful well by eliminating drilling problems and controlling the flow rate of hydrocarbons to the surface while drilling, tripping and running the completion.

The real-time hydraulics model and automated choke system helped to maintain the desired BHP at all times, with the real-time surge/swab application used during tripping operations to eliminate major loss/gains. Any unexpected hydrocarbon influx was safely circulated out through the MPD choke, saving considerable rig time.

The GeoBalance MPD service added value by estimating pore pressure and fracture gradient values during drilling, thus reducing rig time and costs associated with carrying out such tests in conventional drilling.

Because the GeoBalance MPD service was able to precisely control the BHP at all times during drilling, a constant BHP was maintained that helped reduce losses typically experienced in the fractured granite. Post-well flow testing showed successful mitigation of reservoir damage due to LCM and drilling fluid loss to the formation, and well control incidents were successfully mitigated, with no major lost time recorded.