Deviating From The Norm: Delivering Ultra Deepwater Exploration Well With MPD System, Utilizing Statically Underbalance Mud Weight

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Abstract

Objectives/Scope: Challenges in any deepwater exploration wells are inevitable, especially narrow drilling margin conditions. For the first time, PETRONAS accepted the challenge and drilled a wildcat ultra-deepwater well with a water depth of 2884m, using statically underbalance mud weight with the support of Managed Pressure Drilling (MPD) system. The objective of the well is to drill, log and plug and abandon a thick carbonate reservoir, offshore Sabah. The MPD system was fully integrated with the rig. MPD Constant Bottom Hole Pressure (CBHP) approach was planned for three (3) hole sections, namely 17”, 12-1/4” and 8-1/2”.

Methods, Procedures, Process: The MPD integrated riser joint (MPD IRJ) utilized in this well consists of RCD body, a drill string isolation tool, a flowspool, an upper and lower adaptor that connects the RCD joint to the last riser joint and the termination joint. The MPD riser joint was run and installed in a single piece. For the RCD bearing assembly, polyurethane stripper elements were used for the intermediate sections using synthetic-based mud SBM and natural stripper elements for the reservoir section using water-based mud (WBM).

Results, Observations, Conclusions: In the actual drilling activity, MPD CBHP was only performed in the 12-1/4” and 8-1/2” hole sections. For both the hole sections, the system was displaced with underbalanced mud and followed by MPD fingerprinting. Following the fingerprinting, shoe-track and 3m of new formation were drilled and followed by Dynamic Formation Integrity Test (DFIT) to dictate fracture point limitation on the particular hole section. For the 12-1/4” hole section, surface back-pressure (SBP) was applied during drilling, connection and seismic while drilling (SWD) operation. Once reaching section total depth (TD), a Dynamic Pore Pressure Test (DPPT) was conducted to dictate the pore pressure at the top of carbonate and eventually to decide on the suitable mud weight for the next hole section. For the 8-1/2” hole section, surface back-pressure was applied during drilling and connection until reaching well TD.

Novel/Additive Information: This project has opened a new horizon within the organization on the do-ability of this method which has a huge potential for cost saving for the company. However, one should always be aware that this operation has its own challenges and adequate risk assessments and mitigations should be in place during planning to ensure a safe and smooth operation.