DGMK/ÖGEW-Frühjahrstagung, Fachbereich Aufsuchung und Gewinnung
Celle, 5./6. April 2017

Case study: Wellbore stability challenges in the wells Suderbruch 2001/2002

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Abstract

The Suderbruch field is situated ~40km NW of Hannover. The 99 wells drilled throughout the 1950s produced 3.4 Mio tons of oil before field abandonment was initiated in 1996. Recent studies identified the Suderbruch field to offer potential for re-development using modern drilling & production techniques. As a result of the studies, two wells were planned to evaluate the remaining oil potential and a possible re-development of the field. The drilling campaign started at the end of 2015 and the wells were significantly more challenging than those drilled in the past. Both wells encountered wellbore stability issues in the 12-1/4” sections, especially in the Alb Formation of the Lower Cretaceous. No wellbore stability study was available and relevant offset data was sparse but it was known that the area is complex, heavily faulted and tectonically influenced. The first well had an S-shape 3D trajectory in order to manage anti-collision issues, while aligning on multiple geological targets. A KCl-Polymer-WBM was used to drill the 12-1/4” section. Chalk was used as a primary weighting agent as it was planned to carry over the mud into the deeper lying reservoir sections. Difficulties in the 12-1/4” section resulted in problems maintaining the mud: a) effective solids removal from the wellbore; b) maintaining fine solids portion of the mud within required specs. These factors led to high torque and drag, high mud viscosity and ECD spikes, several stuck pipe events which resulted in destabilization of sensitive formation. After time consuming reaming runs, wireline logging was unable to pass the Upper Alb formation. Caliper measurements to that depth indicated washouts of up to 30” in the open hole. The casing was run to the planned depth with circulation and heavy rotation necessary. In the second well the 12-1/4” section built inclination to just below horizontal, landing the casing as planned was essential for the subsequent 8-1/2” horizontal Geosteering section. Various lessons learned were implemented in the second well, including optimization of the mud system, drilling systems and logging techniques. Operational procedures were reviewed in detail to minimize destabilization of the wellbore and extreme attention to detail was required of all personnel involved in the operations. The result: The mud was in spec, drilling mechanics were significantly improved. The section was landed as planned in one run, and the casing run in hole without problems. This laid the foundation for a successful geosteering operation. However, it was observed that the amount of cavings from the most troublesome formations remained high. This leaves room for further investigation and optimization ahead of future wells. In general, the case study emphasizes the message that wellbore stability is a complex, multi-layered issue where the implementation of one solution often exacerbates another problem. It is the key objective of the planning phase to prioritize objectives and define the associated risks. To successfully overcome the most severe wellbore stability challenges, teamwork, optimization and a certain degree of compromise is required.