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Drilling Weak Formations in Rumaila Field in Southern Iraq — Modelling Shear Failure Using Numerical Models

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Abstract

The giant Rumaila oilfield in south Iraq has been plagued by a number of wellbore instabilities. The shaley formations in this field pose the greatest challenges to drilling operations, accounting for approximately 90% of the problems. Stuck pipe, tight hole, and borehole collapse are examples of the incidents commonly encountered even while drilling vertical and deviated wells.

This paper presents a well planning tool for translating the geomechanics simulation results to operational parameters, and in so doing, informing well trajectory planning and optimization. Specifically, the main objective was to generate shear failure mud weight cubes for different trajectories, The scenarios considered focused on examining the impact of depletion on field performance, drilling and well completion integrity for making life-of-reservoir decisions. The mechanical properties were first estimated along the trajectories of multiple 1D mechanical earth models (1D-MEMs) byutilizing available rock mechanics testing results, followed by geostatical populationin 3D space. The final 3D-MEM was calibrated against field observations.

Introduction

Reservoir geomechanics plays a vitally important role in minimizing drilling activity costs and informing field development planning. Comprehensive geomechanical models (1D, 3D and 4D) were built in the Rumaila Field based on a wide array of inputs taken from 14 wells distributed across the field. The analysis examined the past shear failures observed in the main reservoirs—namely: Mishrif and Zubair Main Pay —and addressed additional instability modes generally es encountered while drilling the non-reservoir formations in Rumaila. The dataset used in the present study included openhole logs, rock mechanics testing data, production data, and pressure data. The main objectives of this study were to build a field-scale shear failure gradient model with a view to assessing the impact of production-induced stress changes on drilling and well completion integrity (Al-Asadi 2021).