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Analysis of Interparticle interactions in High Waxy-Heavy Clay Fine Sands for Sand Control Optimization

Authors : Gerald Gwamba

Abstract : Formation and oil well sand production is one of the greatest and oldest concerns for the Oil and gas industry. The production of sand particles may vary from very small and limited amounts to far elevated levels which has the potential to block or plug the pore spaces near the perforated points to blocking production from surface facilities. Therefore, the timely and reliable investigation of conditions leading to the onset or quantifying sanding while producing is imperative. The challenges of sand production are even more elevated while producing in Waxy and Heavy wells with Clay Fine sands (WHFC). Existing research argues that both waxy and heavy hydrocarbons exhibit far differing characteristics with waxy more paraffinic while heavy crude oils exhibit more asphaltenic properties. Moreover, the combined effect of WHFC conditions presents more complexity in production as opposed to individual effects that could be attributed to a consolidation of a surmountable opposing force. However, research on a combined high WHFC system could depict a better representation of the surmountable effect which in essence is more comparable to field conditions where a one-sided view of either individual effects on sanding has been argued to some extent misrepresentative of actual field conditions since all factors act surmountably. In recognition of the limited customized research on sand production studies with the combined effect of WHFC however, our research seeks to apply the Design of Experiments (DOE) methodology based on latest literature to analyze the relationship between various interparticle factors in relation to selected sand control methods. Our research aims to unearth a better understanding of how the combined effect of interparticle factors including: strength, cementation, particle size and production rate among others could better assist in the design of an optimal sand control system for the WHFC well conditions. In this regard, we seek to answer the following research question: How does the combined effect of interparticle factors affect the optimization of sand control systems for WHFC wells? Results from experimental data collection will inform a better justification for a sand control design for WHFC. In doing so, we hope to contribute to earlier contrasts arguing that sand production could potentially enable well self-permeability enhancement caused by the establishment of new flow channels created by loosening and detachment of sand grains. We hope that our research will contribute to future sand control designs capable of adapting to flexible production adjustments in controlled sand management. This paper presents results which are part of an ongoing research towards the authors' PhD project in the optimization of sand control systems for WHFC wells.

Keywords : waxy-heavy oils, clay-fine sands, sand control optimization, interparticle factors, design of experiments
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