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Transient flows in wellbore during killing of empty well

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Gas drilling has the advantages of a high drilling speed, reservoir protection, and higher production capacity when applied to single wells. However, failure to adequately equip the wellhead with appropriate well control equipment may result in the generation of a high pressure in the gas drill when it reaches a high-yield gas layer. This would require the execution of a well killing operation to facilitate follow-up drilling and completion of the well. The killing of an empty gas-drilled well involves a number of physical processes, namely, empty gas-phase well boring, implementation of a gas-liquid two-phase transient flow, and filling with killing mud. The operation may also entail coupling of the transient seepage from the formation with the gas-liquid two-phase transient flow through the wellbore. In this study, a mathematical model and numerical method for coupling the transient gas flow through the formation with the gas-liquid two-phase transient flow through the wellbore were developed. The development of the model was based on existing theories of transient formation seepage and wellbore gas-liquid two-phase flow. The numerical simulation results showed that successful killing of an empty gas-drilled well required proper coordination of several key parameters such as the wellhead back pressure, pump displacement, and density of the killing fluid, with the wellhead back pressure being particularly critical to the operation. The findings of this study promise to facilitate the process design and parameter optimization for killing empty gas-drilled wells.

Biography

Hanming Xu has completed his PhD at the age of 31 years from Southwest Petroleum University, China. He has published more than 16 papers in reputed journals and has been serving as an editorial board member of repute.

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