Assessment Development Plans of Hydraulic Fracturing in Bakken Oil Wells Using Integral Approach

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Abstract

Multistage hydraulic fracturing horizontal wells has proved to be a feasible drilling and completion technique to develop unconventional reservoirs, such as the Bakken Fm. However, successful implementation of this technique has been a challenge and a function of several factors which can affect the production rate and economic revenues. Hence, it is crucial to develop optimal drilling/completion strategies to achieve the short- and long-term production targets. To assess the current industry practice for hydraulic fracturing in the Williston Basin and devise optimal development strategies for Bakken wells, a four-step analysis is conducted in this work: a) rate trainset analysis (RTA) to evaluate the current completion plans practiced by the Williston Basin industry and assess possible offset frac-hits and/or child-parent well intervention, b) sensitivity analysis to examine the factors affecting the production performance (expected ultimate recovery, EUR) and net-present value (NPV), c) a series of 2D fracture simulation to study the impact of different well/reservoir and fracturing treatment properties on fracture-network/SRV properties, including proppants, fracturing fluids, and additives, d) fully-3D/FEM fracture simulation to refine optimal pump schedule for fracture confinement in the target zone. In summary, this comprehensive study will help us to better understand the practical and physical limitations of what is possible in hydraulic fracturing design for Bakken/Three Forks wells, with respect to the size of SRVs and optimal fracture properties at reasonable operational costs. The findings can be applied and compared to other unconventional shale plays, such as Eagle Ford and Permian Basin.