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Modeling Study of Variation of Hydraulic Fracture Initiation and Location on Production Results Before and After Re-Fracturing

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Abstract

This study models possible production results before and after refracturing of a horizontal well in an unconventional reservoir. Production simulation models are generated wherein fracture initiation and propagation in a shale formation are assumed not to occur in all perforation clusters within a stage. Different configurations of cluster breakdown and fracture propagation are modeled and “produced” for five years. After five years of production, the stage is “refractured,” modeling stimulation of previously unstimulated rock volume. This work also investigates the impact of other effects, such as darcy and non-darcy flow, on production results, and the potential economic value of a re-stimulation under the model conditions.

Significant differences in production results are observed under different scenarios. Possible reasons are that one model has more effective fracture area initially than the other, and fracture distribution in one model is more even than in the other. This implies that initial effectiveness of perforation cluster breakdown and fracture propagation / surface area generation influence the future performance of the well and the refracturing response. Both models consistently indicate that Non-Darcy flow shows a significant impact on both initial production rate and post-refracture production performance.

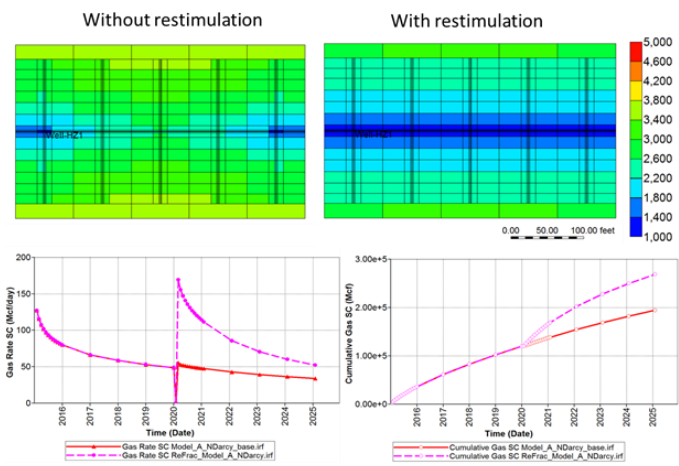


Fig.1-Pressure Map, production and its cumulative plot for an initial 2-cluster stimulation and its consequent re-stimulation effect after five years of initial production.

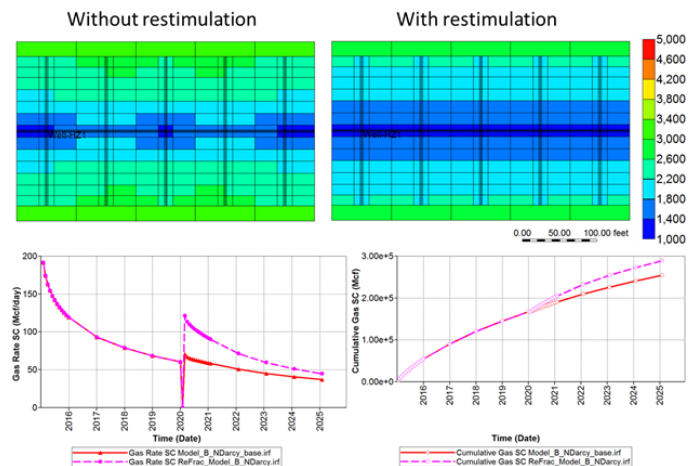


Fig.2-Pressure Map, production and its cumulative plot for an initial 3-cluster stimulation and its consequent re-stimulation effect after five years of initial production.