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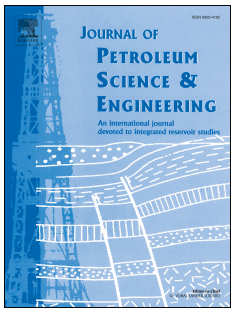

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Modeling Vertical Well in Field-Scale Discrete Fracture-Matrix Model Using a Practical Pseudo Inner-Boundary Model

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Abstract

The discrete fracture-matrix model (DFM) technique has contributed to the rapid development of fracture modeling. In terms of vertical well modeling, however, the current well models fail to handle the field-scale DFM utilization. In this study, a pseudo inner-boundary model is presented tailored to this problem. Specifically, the modeling methodology includes mesh generation and transmissibility evaluation. Regarding the mesh generation, the model handles the 2-D triangular-gridded matrix and 1-D edge-gridded fracture. The strict geometric analogy to generate triangles for the wellbore is abandoned, instead, the wellbore is approximated by a source/sink point and returns to a circular geometry when evaluating the transmissibility. The treatment sheds the limitation of triangle size and proves to boost the generation efficiency. Regarding the transmissibility evaluation, the derived formulations apply the radial/linear approximation for flow in matrix/fracture well-gridblocks, and various conditions are considered, including gridblock geometry (triangle and rectangle), flow state (steady-state, unsteady-state and pseudosteady-state) and well completion (fully penetrating well and partially penetrating well). In addition, the compatibility with the star-delta transformation is discussed. By refining the well-gridblock into several sub-triangles, the formulations could be rapidly implemented to non-triangle-based DFM (e.g. PEBI, Cartesian). The model