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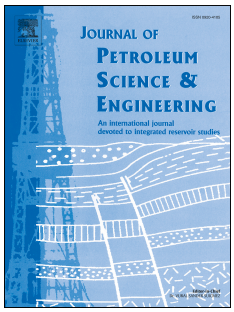

Productivity of multiple fractures in a closed rectangular reservoir

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Productivity of multiple fractures in a closed rectangular reservoir

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Abstract

It is found that hydraulic fractures always exhibit complex geometry patterns by direct observation on fractured cores, geological evidence and laboratory experiments. The main objectives of this paper are to propose a new uniform-flux solution and analyze the productivity index of the complex fractures in a closed rectangular reservoir.

Firstly, we present mathematical models of productivity index for single wing and complex fractures with the principle of superposition based on the new uniform-flux solution with angle β in a closed rectangular reservoir, respectively. Secondly, 3 cases have been used to verify uniform-flux solution and productivity index for a finite-conductivity fracture. It is demonstrated that results from our new method match other solutions very well. Thirdly, the new semi-analytical method is employed to obtain the productivity index for other complex fracture patterns, including asymmetric fracture, non-planar fracture and multi-wing fractures connected to a vertical well or a horizontal well. The effects of the asymmetry, the distribution, the rotation, the number, the azimuth, the penetration ratio and the conductivity of the fractures on the productivity index have been discussed in details.