

عنوان مقاله:

Design and optimization of hydraulic fracturing in unconventional reservoirs using a hydro-mechanically coupled fracturing simulator

محل انتشار:

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خلاصه مقاله:

Multistage hydraulic fracturing completions together with simultaneous fracturing of parallel laterals are central to enhance productivity of horizontal wells completed in shale reservoirs with extremely low permeability. An efficient fracture network in the reservoir with the least number of deviated or collapsed fractures prevents poor connectivity with the surrounding reservoir volume, reduction in reserve estimates per well, loss in well productivity, reduced drainage areas, and higher completion costs associated with the ineffective fractures. Therefore, simulation of hydraulic fracturing plays an important role in design of hydraulic fracturing since it creates the opportunity to observe the behavior of stationary and propagating fractures in presence of other fractures considering different fracturing schemes. In this paper, a two-dimensional hydraulic fracturing simulator is presented which is capable of simulation of fracture propagation in one stage considering previously created fractures, natural fractures, and different fracturing schemes. A hybrid method of Displacement Discontinuity Method (DDM) and Finite Difference Method (FDM) has been used for programming of the code. Propagation potential of hydraulic fractures is checked using displacement discontinuities and available criteria for propagation. Crack tip elements have been used for precise simulation of tip displacement discontinuities. Height effect of fractures is included in the simulator for precise prediction of aperture and stresses around fractures. Appropriate boundary conditions (BCs) have been defined for previously created fractures or natural fractures. History has been defined in order to keep the effect of previously created or natural fractures on the current stage of fracturing. The simulator is tested on the Barnett shale and the results are shown to illustrate the capabilities of the simulator in design and optimization of fracturing.

کلمات کلیدی:

Hydraulic fracturing, propagation, simultaneous multistage fracturing, zipper fracturing, Displacement Discontinuity Method (DDM), Fluid flow

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