Numerical models for hydraulic refracturing

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The paper presents an approach for simulation of refracturing treatment on vertical and horizontal oil wells. The model is accounting for filtration of hydraulic fracturing fluid through the proppant packed inside the crack formed during previous hydraulic fracturing treatments. The simulations provide a possibility to estimate history of stress intensity factor appearing at the tip of the existing crack once the time profile of pressure within the wellbore is given. Introducing critical value of the stress intensity factor for the fractured media, time-to-fracture initiation (after pressure increase start) can be estimated and compared to instance of fracture event registered in real conditions. Also, the possibility of fracture reorientation through formation of new fractures at the region adjacent to the wellbore is studied.

It will be demonstrated that within the framework of the developed models is unlikely that refracturing will result in formation of new fractures in the vicinity on the vertical wellbore. In the case of vertical wells, for practically utilized process parameters, refracturing treatment will increase the length of fractures obtained during initial hydraulic fracturing and supersede the old proppant pack by the new proppant.

In the case of refracturing treatment on horizontal wells, the developed model demonstrates a possibility to initiate new fracture in a vicinity of the well for some of the practically utilized process parameters.