Geomechanical Behavior of Fault System and Its Application in Completion and Stimulation Design for Fractured-Vuggy Carbonate Reservoir

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Abstract

In fractured-vuggy carbonate reservoir, faults and fractures usually control the distribution of hydrocarbon and affect in-situ stress field obviously. The storage capacity of formation is various from fault system, cave system and even matrix types. The permeability and porosity are different when the distance to a fault various, which could be extremely important for engineering design and practice.

After a systematical evaluation of all the factors, such as burial depth, fault throw, dip angle, strike, lithology variation, pore pressure and the in-situ stress field, critical factor that controls permeability is founded; which was the geomechanical behavior of faults. To evaluate geomechanical behavior of fault system, we built up a stress field model, proposed mechanical criteria to analysis faults activities. We calculated the normal and shear stresses perpendicular or parallel to the fault planes, selected permeable zone and analyzed the relationship between permeable zone and critical stress state section.

This study combined geological concepts with geomechanical analysis and engineering methods, which were positive in fractured-vuggy carbonate reservoir development, and finally classified the faults in a typical carbonate reservoir based on geomechanical behaviors, provided quantitative selection criteria for well completion and wellbore stimulation design, improved development efficiency of this type of fractured-vuggy reservoir.