Integration of Geomechanics, Stress Field and Reservoir Production to Predict Dynamic Fractures Behavior for Tight Sandstone Reservoir

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Abstract

The unconventional reservoirs such as tight sandstone reservoirs in Ordos Basin westward of China, have received widespread attention over the past two decades for the deepening of petroleum knowledge and incessant technology progress. Along with long-term water flooding in these reservoirs, the dynamic fractures are identified by the production performance, tracer test, microseismic data etc. and their behaviors are summarized as the opening, extending and reclosing. An integrated study was conducted integrates geomechanics, stress field, reservoir characteristics and production to describe dynamic fractures and optimize the development of reservoir. Controlled by the geomechanics and paleo-stress field, the natural fractures develop in the reservoir with their state originally closed or filled. Subsequently due to high pressure in near wellbore area of injection wells, the closed or filled natural fractures are reactivated, constantly extend controlled by in-situ stress field and may reclosed under the decreasing pressure in moderate injection. The complexity of the dynamic fractures is influenced by lithology-based geomechanics, the difficult determined paleo and current stress field, varied production measures and history, which are necessary to predict dynamic fractures behavior. In the study, an integrated approach is proposed and applied to a tight sandstone reservoir as a case study. The geomechanics model is first built up to predict potential natural fractures distribution under the paleo-stress field. These fractures are evaluated to determine the existence and behaviors of dynamic fractures based on the analysis of production performance and current stress field. The behaviors of dynamic fractures are testified by tests and beneficial for the optimization and adjustment for the tight sandstone reservoir development.