Internal Structures of Fault Zones and Their Relationship With Shallow Gas Migration and Accumulation in Sanhecun Sag, Jiyang Depression East China

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ABSTRACT

Shallow gas in Sanhecun oilfield, Jiyang Depression has been largely encountered in Guantao formation and Minghuazhen formation. The distribution of shallow gas reservoirs shows close relationship with faults. Various data including 3-D seismic data, well logging, core and laboratory test data were integrated to qualitatively classify internal structures of faults and study how the faults control shallow gas migration and accumulation. For each studied fault, a series of logging curves (including RT, AC, SP, COND etc.) of two adjacent wells (one of which drilling into fault zone while the other not) were normalized to build interval difference coefficient, which help identify the distribution of fault zone precisely. Through calculating the AC change rate, combing the characteristics of DEN and CNL, the core zone could be identified with the characteristic of low AC change rate, high DEN and low CNL, while the damage zone with the characteristic of high AC change rate, low DEN and high CNL. Complete core zone and damage zone could be identified in Sanhecun oilfield. The damage zones are still not cemented under the observation of microscope and the calculation from logging curves shows high porosity and permeability, which indicate the strong transporting capacity. The damage zones are the “high way” for gas vertical migration and gas would entrance the sandstones with high porosity and permeability adjacent to faults selectively during vertical migration. Large amount of mudstone occurs in core zones and the laboratory test shows that the entrance pressure of core zones is 2 to 3 orders of magnitude higher than that of reservoirs adjacent to fault, which indicates high sealing ability of the core zones. The core zones with high sealing ability prevents the gas from long lateral migration and, together with sand body boundary, controls the distribution of shallow gas.