Contribution ID: **344** Type: **Poster**

Influence on Oil-water Flow Mechanism with Hydraulic Fracture Existed in Low-permeability Reservoir

Tuesday, 15 May 2018 18:30 (15 minutes)

Hydraulic fracturing is one of the most effective treatment methods in development of low permeability reservoir which improve the conductivity of the formation such that the reservoir liquids seepage capacity is enhanced with flow friction reduced, which highly increase the withdrawal of underground liquid. However, with the existing of hydraulic fractures and due to the complication of their morphology, seepage of water and oil in the porous is getting complicate. In order to figure out the oil and water flow mechanism, physical and numerical simulation are designed to research the oil-water seepage law of low-permeability oil reservoir and the influences of fracture on reservoir development effect. Experiments of oil-water displacement are conducted and sample cores of three kinds of fracture morphology (no fracture, horizontal fracture and vertical fracture) and four permeability level (5,10,30,50×10-3μm2) are used from low permeability turbidite reservoir. Experimental results are discussed and compared with a coupled fracture and flow model. Variation among different kinds of fractures and levels of permeability are presented. Results show that with the presence of the artificial fracture, the threshold pressure gradient decreases, the oil relative permeability curve drops, the water relative permeability curve rises, the saturation of remaining oils increases, and the two-phase flow area of tested cores becomes narrower. The water flooding recovery of the core with vertical cracks is larger than that without fracture which improves the effect of water-flooding. While the flooding effect turns out to be poorer with the presence of horizontal fracture through the samples. Results can be used in numerical simulation of developing low permeability reservoirs.

References

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Session Classification: Poster 2

Track Classification: MS 4.11: Multiphase flow through fractured/fractured karst carbonate reservoirs