Heterogeneity Characteristics and Controlling Factors of Thick Bioclastic Limestone Reservoirs

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The thick bioclastic limestone reservoirs of Cretaceous Mishrif Formation in H oilfield, SE Iraq have 9.1 billion recoverable reserves.But due to the reservoir heterogeneity, it is difficult to develop effectively. Based on the core, cast thin section, whole rock analysis, conventional physical properties and high pressure mercury intrusion test, the sedimentary analysis and diagenesis characteristics study, it shows that the heterogeneity of thick bioclastic limestone reservior is controlled by sedimentary facies, sequence stratigraphy. There developed “Weak-rimmed carbonate ramp" model, which included 8 kinds of microfacies: bioclastic shoal, shoal flank, lagoon, tidal channel, swamp, incision, supratidal and middle ramp. Reflection coefficient inversion show obvious lateral accretion of shoal, which reflect that there were many stages of shoals. The rudist shoal has the characteristics of “strong dissolution, weak cementation and strong compaction”, forming pore-type reservoir with intergranular pores, intergranular dissolved pores, mold pores, and dissolved pores. With mainly coarse pore throats larger than 5 μm, the reservoir is of medium-high porosity and high permeability. There is lithological reverse cycles inside single shoals and between single shoals, with content of mud crystals decreasing from the bottom to the top, dissolution increasing, cementation decreasing in strength, pore throats getting larger, and physical properties turning better. The tidal channel can be recognized by typical sedimentary dual structure in sedimentary profile. The Frequency division fusion show the transportation of tidal channel, which helped to confirm the size and scale around the well.The barrier types of Mishrif Fm. includes swamp coaly shale, lagoon mudstone to wackestone and incision mudstone. The barrier distribution study helped the water injection performance.In Mishrif Fm., the High Permeability Streaks (HPS) are controlled by shoal architecture, sequence boundary and fracture. They are recognized the confirmed by available PLT data. This study helped to improve the productivity and planned injectors.