

The Cutoff of Flowing Porosity in Tight Complex Carbonate Oil Reservoir: A Case Study on High-Pressure Mercury Intrusion in Interval MBK, Block SH, Iraq

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ABSTRACT

Based on the porosity measured by high pressure mercury intrusion and helium experiments, and analysis of oil saturation data of 29 samples of tight formations of interval MBK in SH block, in the northwest of Kurdish Region of Iraq, the cutoff value of flowing porosity in tight complex carbonate oil and its controlling factors are determined. According to the conversion between capillary pressure in reservoir conditions and capillary pressure from high pressure mercury intrusion experiments, flowing porosity in various injection pressures in reservoir condition can be calculated. By calculating the minimum flowing porosity of oil-bearing samples and the maximum flowing porosity of the samples without oil, it is confirmed that 3.1% is the lowest limit for the flowing porosity in oil-bearing samples in the study area; and the corresponding injection pressure in reservoir conditions is 19.9 Psi. If the injection pressure is higher than 19.9 Psi, the oil can freely flow and accumulate. The relationships among flowing porosity, injection pressure and pore-throat-ratio are showed by the analysis of pore-throat-ratio, injection pressure, and the 4 different reservoir types (the fracture porosity type, the porosity one, the vuggy one and the complex one). The flowing porosity of tight carbonate formations and pore-throat-ratio are negatively related. The poorer connectivity of pore-throat in reservoirs is, the higher injection pressure is needed for the flowing porosity to be 3.1%. The injection pressure has a negative correlation to reservoir quality index (RQI). With the reservoir quality index (RQI) increasing, the injection pressure, which is needed for flowing porosity to be 3.1%, is in a decreasing tendency. On the basis of the cutoff value of tight complex carbonate of the flowing porosity and injection pressure in reservoir conditions, the discriminant chart of effective accumulation of tight oil in complex carbonate is established.