Pore Networks and Reservoir-Quality Trends in Lower Cretaceous Carbonates of the Northern Rim of the Gulf of Mexico: Substantiating Reservoir-Quality Risk Factors

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ABSTRACT

Understanding the relationship between reservoir quality and associated parameters, such as depth, temperature, and pressure, is important for developing valid risk factors relative to reservoir quality in carbonate plays. To develop concepts that aid in understanding and calculating reservoir-quality risk factors for the onshore northern rim of the Gulf of Mexico, a large statistical database with over 21,000 core-plug porosity and permeability data points was constructed. Each data point is associated with parameters such as location, formation, depth, temperature, and pressure.

Graphs constructed from the database document how reservoir quality varies with depth and temperature for all the combined Gulf of Mexico data and for data separated by 6 geographic zones along the northern rim of the Gulf of Mexico. These graphs can be used as "reality checks" on predicted values of reservoir quality for a given play. If the estimated values are higher than what the database shows, a sound scientific reason must be provided to account for the difference.

Reviews of nine case histories where the geology, pore types, and reservoir quality are known suggest two main reservoir-quality pore-network suites: macropore-dominated and micropore-dominated. The macropore network occurs at shallower depths (generally less than 12,000 ft [3660 m]) and has high reservoir quality that is related to an interparticle- and moldic-dominated pore network, whereas the micropore network occurs at deeper depths (generally greater than 12,000 ft [3660 m]) and is related to a variety of micropores.

Large statistical databases, integrated with geologic parameters, provide insights into reservoir quality under varying burial environmental conditions. These insights support choosing a realistic risk factor for a particular play.

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