



Quick-Look Deterministic Approach for Evaluating Shale Distribution in Sandstone Reservoirs: Physical Framework and Analytical Procedure with Case Study Examples

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ABSTRACT

Shale distribution in sandstone reservoirs can be broadly described in terms of three components: shale laminations interlayered within the overall sandstone interval, dispersed shale within the overall sandstone pore network, and structural shale comprised of sand-sized particles of shale composition. We describe herein the quantification of shale distribution types using quick-look deterministic graphical and mathematical analyses using total porosity versus shale volume, effective porosity versus shale volume, and density porosity versus neutron porosity. Use of conventional triple combination log data is capable of determining the range of distribution quantities (from most pessimistic to most optimistic in terms of reservoir quality), but additional data such as nuclear magnetic resonance, core, and triaxial resistivity log data can constrain these ranges to specific quantities. Determination of the laminar shale fraction determines the sandstone fraction; the dispersed shale fraction reduces the effective porosity of the sand-

stone fraction; and the structural shale fraction further reduces the useful porosity of the sandstone fraction.