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Global Comparison of Reservoir Quality Trends in Deep-water Reservoirs: Implications for Exploration and Production

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Confidence in the prediction of reservoir quality in deep-water facies is enhanced by examination of well-documented analogs, both adjacent to, and remote from, the area of interest. Guidelines for the assessment of porosity and permeability of deep-water reservoirs in a range of settings have emerged from a global review of more than 100, well-documented producing fields. Burial depth, reservoir type (turbidite facies association), reservoir age, overpressure and sediment provenance are identified as the primary determinants of porosity variability. Lower-order, locally effective controls include diagenesis associated with hydrocarbon-water contacts and adjacent to shale bodies. Intracontinental-basin examples from the North Sea, Gulf of Suez and the Permian Basin reveal recurring patterns of reservoir quality variation that distinguish them from passive-margin (west African basins, GOM, etc.) and transform-margin basins (Nile Delta, California, etc.). Shelf-fed turbidite sands (e.g., Campos Basin and Paleocene of the North Sea) tend to be better-sorted and of intrinsically higher quality than those fed directly from major river deltas. Typical porosities in passive-margin basins are of the order of 17-33% (overall average: 27%), with typical permeabilities around 400-1000 mD (overall average: ~565 mD). This good reservoir quality is ascribed mainly to relatively shallow burial (<7500 ft), relatively brief diagenetic histories and/or overpressuring. These relatively high porosities yield high production rates and render the sands seismically visible. The higher-porosity sands (>27% porosity), however, are weakly consolidated and subject to disintegration during production, with the potential to significantly impair well rates and ultimate recovery.