

Stratigraphy and Reservoir Framework, Tengiz Field, Western Kazakhstan

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The super-giant Tengiz field of western Kazakhstan produces oil from an isolated carbonate platform (areal extent of 160 km²) of Devonian and Carboniferous age. Seismic and well data clearly show two principle regions within the buildup – platform and flank – that directly relate to reservoir quality and production characteristics.

The supersequence-scale stratigraphic framework was developed through an integrated interpretation of seismic, core, log, and biostratigraphic data. An initial broad Late Devonian platform exhibits was followed by punctuated backsteps during the Tournaisian and Viséan. The Serpukhovian is characterized by several kilometers of platform progradation. Drowning in the Early Bashkirian halted carbonate platform growth. Paleotopographic relief from the top of the Bashkirian platform to the basin floor approaches 1,500 meters.

On the platform, hydrocarbons are produced from Upper Viséan through Bashkirian grainstones and mud-lean packstones. Multiple porosity types are recognized, but matrix permeability is controlled primarily by intergranular porosity. Within the flanks, in-place upper-slope microbial boundstone and transported lower-slope boundstone debris form thick and areally extensive mappable reservoirs (Late Viséan and Serpukhovian) that have distinctive seismic facies and production/performance characteristics. Fractures contribute to non-matrix permeability in these boundstones.

The coarse stratigraphic architecture was used to further subdivide the platform portion of the reservoir for better reservoir characterization and for reservoir modeling. The temporal and spatial variability in reservoir quality of the platform, as shown by cross sections and maps, is directly related to stratigraphy. The reservoir is also partitioned based on geographic position along a platform-to-basin profile. Time-slice mapping of synchronous depositional facies provides the basis for predicting reservoir distribution and continuity.
