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New sequence stratigraphic interpretation of the Jurassic Vasyugan sandstone reservoirs of the West Siberia

The Middle to Upper Jurassic sandstones of the Vasyugan Formation is the second largest hydrocarbon-producing interval in West Siberia (after the "Clinoform Neocomian"). A traditional perception of the structure of Vasyugan reservoirs is a 'layer-cake' model with continuous and generally flat-lying shallow marine sandstone beds. The results of our integrated study of well-logs (more than 500 wells) and core data (30 wells) enhanced by results of 3D seismic analysis (3 volumes) on five oil fields showed a considerably more complex and heterogenous structure of the interval. It was concluded that up to 50% of the main reservoirs that were previously identified as shallow marine units, were actually deposited in fluvial streams, deltas/estuaries, tidal sand flats, and incised valleys. The spatial distribution of the depositional systems was controlled by a complex interaction of local tectonic events with variations in sediment supply and possibly eustatic changes. These considerations resulted in a profound impact on reservoir delineation and characterization and in many cases led to a total reinterpretation of the reservoir geometries and models of property distribution.

A regional reassessment of the results by application of sequence stratigraphy led us to generate a new regional depositional model for the Vasyugan deposits of southeastern and central West Siberia. The proposed model may be applied as an analog framework for geological modeling of the individual fields in the region, and may potentially lead to significant improvement of the reservoir models for planning field development and generation of additional plays.