

Relationship between Reservoir Quality Sandstone and Tectonics: Carboniferous Kiskatinaw Formation, Western Canada Basin

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Abstract

The siliciclastic dominated Kiskatinaw Formation, a prolific reservoir in the western Canada Basin, is the middle formation of the Carboniferous (Visean-Serpukhovian) Stoddart Group that was deposited within a tectonically active graben complex.

The lower Kiskatinaw Formation sand was deposited as fluvio-estuary depositional systems within tectonically active subbasins. Kiskatinaw sandstone, in contrast to most fluvio-estuary sandstone units, is very mature. This maturity can be explained by reworking processes triggered by tectonics and a mature source.

Locally, clean and mature sandstone resulted from multiple cut and fill processes due to lower rates of accommodation space creation as controlled by syndepositional tectonics. Early post depositional tectonics further enhanced the maturity by reworking previously deposited sediments from intrabasinal highs.

Commonly, sandstones have higher intergranular volume (IGV) occupied by anhydrite cements. This higher IGV, close to depositional IGV within fluvio-estuary sand, is a result of complex early and late stage diagenesis. Preferential diagenesis, in proximity to sequence stratigraphically significant surfaces (SSSS) (e.g., flooding surfaces), has transformed anhydrite occupied IGV to secondary porosity. The extent of SSSS can be related to tectonic tilting of faulted subblocks.

In summary, tectonics represented the dominant control on deposition and preservation of reservoir quality sandstone within the Kiskatinaw Formation. Porosity generating diagenesis is related to the extent and location of SSSS that are often controlled by tectonic tilting. Therefore, Kiskatinaw exploration must rely on better understanding of discrete, local scale tectonic phases.