Cromwell Sandstone Core Studies and Prediction of Reservoir Trends, Haskell County, Oklahoma

Bryant Reasnor[1], Dennis Kerr[1] (1) The University of Tulsa, Tulsa, OK

Reservoir quality in the gas-productive Morrowan Cromwell Sandstone is a challenge to correlate and map. This is mainly due to the low well log (GR and ƒÖ) contrast between reservoir and nonreservoir quality sandstones and a poorly understood depositional setting in previous studies. Facies architecture analysis using two cores and approximately 100 well logs covering four townships provide a means for better prediction of reservoir quality.

From detailed core studies, the Cromwell is regarded as having been deposited in a storm-dominated shelf setting. Physical and biogenic structures coupled with porosity determined from thin section analysis indicate that better quality reservoir rock is developed in the thickest part of sand-ridge deposits. These sandstones exhibit low-angle cross strata with superimposed ripple stratification, and are very well sorted with modal class of upper very fine sand with 10% clay matrix. Primary intergranular porosity is quartz overgrowth and carbonate cement reduced. Thin section porosity of 10% is combined primary porosity and carbonate cement dissolution enhanced secondary porosity.

Parasequence scale correlation and mapping is key to predicting sand-ridge trends. Locally, the informal Cromwell lithostratigraphic unit is made up of five retrogradational parasequence sets and includes two third-order sequence boundaries. Parasequence isopach maps delineate the geometry and trends of the sand ridges. Given the surrounding facies and retrogradational architecture, the best reservoir quality sandstones are located in the middle of the parasequence sets.