3-D Interpretation of the Sequence Stratigraphy and Reservoir Property Distribution in the Belle River Mills Silurian (Niagaran) Reef, St. Clair County, MI

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Silurian (Niagaran) reefs are significant hydrocarbon reservoirs in the Michigan Basin, having produced over 470 MMBO and 2.75 trillion cubic feet of gas. The primary production for these reservoirs is generally low, averaging about 25%, due to their complex internal heterogeneities. 3-D static reservoir models that incorporate detailed facies and sequence stratigraphic interpretations enhance the understanding of the spatial distribution, and possible controlling mechanisms, of reservoir properties. A model created in a study of the Belle River Mills (BRM) Reef, located in St. Claire County, MI, tested modeling parameters, such as variograms, cell sizes, layers, and sequence stratigraphic constraints, to determine which set of parameters ultimately produced the most geologically reasonable model of the BRM reef reservoir. Results of the study indicate that 300 proportional layers and variograms with ranges of 500 feet produce the most geologically representative models of the distribution of facies and reservoir properties throughout the BRM reef. The model illustrates a geometrically well-developed windward margin at the southeastern edge of the reservoir, with higher porosity and permeability values apparent on the eastern margin of the reef. The incorporation of a sequence stratigraphic framework and detailed facies analysis help to improve the geologic integrity of 3-D static reservoir models and, have the potential to enhance primary and secondary production from Michigan Basin Silurian Reef reservoirs.