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Permeability and Porosity Imaging of a Niagaran Pinnacle Reef Using Log Curve Amplitude Slicing of Core Data - Bell River Mills Field, St. Clair County, Michigan

The Bell River Mills Field was discovered in 1961 and produced over 21 BCF of gas before its conversion to a gas storage field in 1965. Thirty-five of the 54 wells in the field were continuously cored through the Niagaran pinnacle reef and the A-1 carbonate/anhydrite. The cores were analyzed to produce more than 6000 measurements of both horizontal permeability and porosity. Core permeability measurements range from zero to eight darcies with both the low and high values affected by equipment measurement limits; 50% of the permeability measurements are less than 2 millidarcies (md) while 40% range from 2 to 100 md. Core porosity ranges from zero to 33%; 15% of the porosity measurements are less than 2% while 83% range from 2 to 20%. Log curve amplitude slicing, a new technique that generates subhorizontal slices through log curves on a foot-by-foot basis, was used to create a series of amplitude slices from the core permeability and porosity curves in these wells. Animations of the core permeability and porosity slices show the detailed distribution of these important reservoir properties throughout most of the pinnacle reef. Integrating the core permeability and porosity animations and previous animations of the gamma ray curve with rock types and formation tops for the Bell River Mills field produces a series of reservoir models that can be used to visualize the likely permeability and porosity distributions for less densely drilled and cored Niagaran pinnacle reefs as well as pinnacle reefs lacking 3D seismic coverage.