Exploring for Tight Oil in the Pennsylvanian Cleveland Sandstone on the Nemaha Ridge Using High Resolution 3D Seismic & Stratigraphic Analysis: A New Play in an Old Area

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Tight sands in the Upper Pennsylvanian Cleveland Fm. are an active development target in the panhandles of Texas and Oklahoma, however, since drilling started in the 1920's along the Nemaha Ridge of north central Oklahoma and south central Kansas the Cleveland has traditionally been viewed as a shallow (2,500'-3,000'), thin, tight-oil "teaser" or tertiary objective on the way down to other more economic objectives. By integrating high-resolution 3D seismic and detailed sequence stratigraphic analysis, thicker, productive Cleveland reservoir fairways can be identified and drilled economically on the Nemaha Ridge.

Cleveland depositional systems in the Nemaha Ridge area include river-dominated deltas and incised valleys, each with distinctive log and seismic characteristics. Deltaic reservoir successions occur in the upper two thirds of the Cleveland interval and are usually the best reservoirs. The deltaic reservoir units are composed of very fine to fine-grained sanding upward successions exhibiting dip-elongate behavior and rapid changes along strike. Cleveland valleys in the study area are blocky to fining-upward, lower medium to very fine grained units that occur in the lower part of the Cleveland succession.

Optimal drilling locations are best identified by fine-scale correlations and seismic mapping, linked to subtle syn-sedimentary tectonics. High-resolution 3D seismic (up to 1.4 million traces per square mile) and seis-facies analysis has proven a key tool in differentiating and predicting optimal reservoir trends in this new play concept on the Nemaha Ridge and sets up and opportunity for focused horizontal exploitation. This type of analysis is broadly applicable to a number of other similar plays in old development