Integrated Interpretation of the Dakota and Cedar Mountain Channel Complexes Play Using 3-D Seismic Attribute Analysis and Well Logs, Uinta Basin, Utah

Keach, R. W.[1]; Birgenheier, Lauren P.[1]; Hokanson, William [2] (1) Energy & Geoscience Institute, University of Utah, Salt Lake City, UT. (2) Geological Sciences, Brigham Young University, Provo, UT.

Detailed well log analysis and core description are combined with high quality 3D seismic surveys located in the southeast portion of the Uinta basin, Utah to delineate future drilling targets within the Dakota and Cedar Mountain channel complexes. Seismic attribute analysis and cross sectional views of the 3D seismic surveys are very effective in delineating reservoir quality channel and channel complexes which serve as the primary gas reservoirs within the Dakota and Cedar Mountain intervals. Three seismic attributes: Waveform Classification, Spectral Decomposition and Percent less than Threshold, are most correlative to the well data, and hence, are used to predict the location of channel complex fairways. Composite attribute maps of the Dakota and Cedar Mountain seismic interval were used to guide isopach contouring of the well picks. The resultant maps indicate the overall geometry and fill lithology (sandstone versus mudrock or heterolith) of channels and channel complexes. In combination, the seismic attributes, well data and core can be used to high grade exploration targets within the play. This work suggests that, used properly, 3D seismic can delineate future target well locations within the Dakota and Cedar Mountain intervals. Without a high quality 3D seismic survey, the explorationist assumes a much greater risk of missing the “sweet spots”.

Explorationists can use 3D seismic to visualize several important geological phenomena associated with the Dakota and Cedar Mountain play. Seismically the sequence can be divided into two sections: 1) the upper Dakota, and 2) the lower Dakota and Cedar Mountain. Channel complexes in the lower Dakota and Cedar Mountain are more sandstone prone relative to those in the upper Dakota, which exhibit more mudrock-dominated or heterolithic fill. In general, sandstone reservoirs in the lower Dakota and Cedar Mountain are organized into sharply-bounded, directionally trending fairways with good connectivity, whereas those in the upper Dakota are more geometrically variable and diffuse with poorer connectivity. These contrasting characteristics fundamentally reflect transgression and changes in the sub-environment of deposition within a fluvial-estuarine system from a fluvial to tidally-dominated environment through time. Finally, subtle topographic or structural highs may increase the hydrocarbon trap potential in any given area.