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Incorporation of Seismic Facies Analysis in 3-D Geological Modeling

The application of neural networks to seismic facies analysis improves the characterization of the 3-D geological model, leading to more accurate volume calculations and well-designs.

This study concentrates on the middle member of the Forbes Formation at Grimes Field, California, a mature field. This formation, an Upper Cretaceous turbidite system, was divided into three members consisting of submarine channels and deep-sea-fan deposits. The gas-producing middle member is made up of interconnected high resistivity sands, separated by shale-rich inter-channel deposits.

This study applies the seismic facies recognition technology within the Middle Member of the Forbes Formation in the Grimes Field and incorporates it into the geological model. The correlations of the available well logs present a clear understanding of the stratigraphy and sedimentation of this member. The deep-water mounds identified on well-log correlations were checked against seismic facies analysis, allowing comparison of conventional methods to seismic facies technology before inclusion into the geological model.

Other conventional attributes were generated. The seismic facies results were calibrated using petro-acoustic analysis. Properties such as fluid substitution and sand thickness were analyzed to test if changes in these properties could be identified by changes in seismic facies.

The correlation found between geologic interpretation and seismic facies results, indicates this seismic method is a powerful tool for stratigraphic trap recognition and hydrocarbon detection which can then be incorporated in building a 3-D model to improve volume calculation and well-design.