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Petrophysical Trend Analysis, a Useful Tool to Understand Reservoir Geometry and Quality in Santa Barbara Field, Norte de Monagas, Venezuela

Two new techniques making use of petrophysical data were introduced in a full blown integrated study in order to decipher the sedimentological and structural complexity of the Santa Barbara Field. Understanding and validating the sedimentology proved difficult because of local folding invoking high angle dips and because of the existence of numerous thrusts and detachment faults. Isochore maps are thus highly disturbed by the structural complexity of the area. Two newly defined methodologies, based on a statistical analysis of petrophysical averages have shed a new light on the Santa Barbara Field. These are based on a semi-quantitative quick-look dip evaluation using net-to-gross derived decompacted isochores and on 3-D visualization of porosity depth trends.

Net-to-Gross maps are very useful to understand and review sedimentary environments, however, N/G values can also be used as a decompaction factor in order to quality control a stratigraphic correlation. A quick-look dip evaluation method has been devised using the ratio between the decompacted thickness of a unit and the equivalent thickness in a reference well. In the Santa Barbara Field, the quick-look dip evaluation has corroborated the existence of large folds and of local detachment planes that have altered the apparent thickness of the unit and dramatically reduced the reservoir quality. Cores confirmed the proposed hypotheses.

The traditional but very powerful Porosity Depth Trend Analysis gave new insight into the structural complexity of the area and confirmed that local reservoir quality deterioration is not linked to lateral facies changes but is due to tectonically derived processes.