

North American Explorationists Monday, December 12, 1994 The H.E.S.S. Building on Buffalo Speedway

The DAK Formation Evaluation Model for the Permian Basin Clearfork

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All of the authors were employed by Shell Western E&P when this work was completed in 1989.

The Clearfork DAK [dolomite, anhydrite, potassium] Mineralogy model is a new formation evaluation procedure developed specifically for the Permian Basin Clearfork formation. Using the physical, geochemical, and mineralogic properties of the Clearfork, a natural log response analysis frame has been developed. The result is a computation of the formation mineralogy and porosity both of which are accurate and valuable for describing reservoirs with this variable lithology matrix.

The Clearfork formation with low permeability and porosity is an economic target for infill drilling and secondary recovery because of its thickness (1,300') and discontinuity. The thick Glorieta–Clearfork interval is actually a series of stacked shallowing–upward carbonate shelf sequences and intraformational clastic rich seals.

Silt was periodically deposited along with the anhydritic dolomite. This mixed lithology created a long standing problem in formation evaluation. The clastic-rich intervals are important because they are locally a reservoir seal and are a time stratigraphic marker. A regional geologic model is used to relate silt mineralogy and log response to the large scale clastic sediment transport process. Our model was tested using core data from the TXL, Central Robertson, and South Wason Clearfork Units.

Applying the DAK formation model results in improved infill assessment and waterflood development. The computed mineralogy and porosity are in excellent agreement with core data. Further, the log derived mineralogy–facies is a major input to reservoir description: identifying chronostratigraphic supratidal clastics for sequence and flow unit correlations. The application of this model to Clearfork reservoir description results in:

- ◆ Log–derived porosity and mineralogy for reservoir description and pay delineation
- ◆ Volumetrics and stratigraphic correlations
- ◆ Improved completions and producer–injector coupling
- ◆ Improved assessment of development drilling opportunities

Biographical Sketch

Ed Clerke is the Petrophysical Engineering Advisor for Pennzoil Exploration and Production Company. He received his doctorate in physics from the University of Maryland in 1982. He then joined the Shell Companies and was involved with open–hole and high–angle hole logging in the Gulf of Mexico, and describing reservoirs in Cognac Field, the Clearfork, and the San Andres. Ed led the final development and field testing of the Shell Second Generation Borehole Televiwer prior to licensing in 1986.

Ed later joined ARCO Exploration and Production Technology where he was involved in petrophysical research and reservoir description projects in many reservoir types around the world. His main interest is the integration of cores to logs in low–permeability reservoirs. He has published articles in various professional journals and holds four patents for borehole televiwer technology and interpretation.