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Dennis W Dull, W. Scott Meddaugh, and Paul Montgomery, ChevronTexaco, Bellaire, TX

Wafra First Eocene Reservoir Model—Application of Sequence Stratigraphy and Geostatistics

The Wafra field is located in the Partitioned Neutral Zone (PNZ) between Saudi Arabia and Kuwait. The field produces from five reservoirs of which the Tertiary First Eocene is the youngest. Eocene production is from pervasively dolomitized peloidal packstones and grainstones deposited in a gently dipping, restricted ramp environment with interbedded evaporates.

Data from several recently cored wells were used to establish a detailed sequence stratigraphic framework for the First Eocene reservoir interval. Cycle and high frequency sequence boundaries were found to correspond with gamma ray well log peaks that could easily be correlated over the 19 km x 19 km field area. The gamma ray well logs enabled the correlation of cycle and cycle sets across the entire reservoir providing a very detailed sequence stratigraphic framework. Many of the cycle and cycle sets are capped by hardgrounds and algal laminated tidal flat deposits. Spectral gamma ray logs showed that the increase in well log gamma ray count associated with the cycle tops is due to an increase in the uranium content.

The geostatistical model utilized data from nearly 200 wells with gamma ray (used for framework correlation), calculated effective porosity curves, and Sw curves. Sequential Gaussian simulation (SGS) was used to distribute porosity by sequence stratigraphic layer. Porosity semivariogram range parameters are 1-4 km with slight NS trend. Permeability was added using stratigraphic layer specific porosity-permeability transform equations. Finally, Sw was added to the reservoir model by colocated cokriging with SGS using the porosity model as secondary data.