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A Multi-Disciplinary Approach for Reservoir Characterization in the Glenn Pool Field, Oklahoma: Abstract

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ABSTRACT

Glenn Pool, a mature marginal oil field, is located on the Northeastern Oklahoma Platform. It has been under production since the first discovery in 1905. Several reservoir treatments have been implemented in the last 50 years following the primary production. However, high reservoir complexity resulted in a large volume of oil to be left in place. Our research is focused on a 160-acre block (Self Unit) where a detailed multi-disciplinary (Geology, Geophysics, Petroleum Engineering) reservoir study was conducted. The purpose of the study is to improve the secondary recovery performance of the field through the use of proper reservoir description and better reservoir management.

Prior to drilling a cooperative project well (Uplands Self #82) Self Unit was studied with conventional methods. Stratigraphic framework of the Glenn Sand reservoir has been established through a series of stratigraphic cross sections. Based on well log correlations the reservoir was divided into six discrete genetic intervals (DGI). Channel-fill, splay, channel-mouth bar, levee and interdistributary mudstone facies were recognized from well log profiles and core analysis. Attempts were made in simulating geology using simple kriging methods; results were not entirely satisfactory.

Uplands Self #82 was drilled in late December, 1993. The project objectives for drilling the well were: 1) evaluate reservoir predictions; 2) collect data using conventional and advanced technologies. Facies architectural characterization before drilling was reasonably successful. Advanced technologies including microresistivity imaging log and crosswell tomography data were acquired as well as the conventional well log suites and core. Simulation of the DGI distribution was undertaken using truncated Gaussian simulation method. Simulation results strongly agree when comparing probability input distributions with the output distributions. Porosity distribution was simulated using the simulated annealing method, and permeability distribution was transformed from porosity using a conditional distribution approach. For a selected well location (Self #82) the comparison between simulated and core porosity/permeability is very good. Crosswell transmission and migrated reflection tomography images between Self #82 and three offset wells constrained lateral reservoir continuity.

A reservoir management plan was developed from reservoir performance simulation, well test data, facies architecture and crosswell tomography.

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