# THE USE OF CORE AND CORE ANALYSES IN AN INTEGRATED STUDY OF THE GRAYBURG/SAN ANDRES RESERVOIR, FOSTER FIELD, ECTOR COUNTY, TEXAS.

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A full reservoir simulation of a portion (865.4 acres) of the Foster Fields was greatly enhanced by detailed core description and cross plots of core analysis data. Six (6) cores were taken in and immediately adjacent to the study area between 1956 and 1979. Although all the analyses are available, only one core still exists which made the evaluation difficult. For the simulation to work, results of the core and thin section description and cross plots of the Φ and K were needed to refine the reservoir simulation model parameters. Plots of the porosity and permeability by well, zone, and depositional facies were generated. Two new wells were cored and the results integrated into the plots. By matching the core and thin section facies descriptions to specific regions on the porosity/permeability plot, specific facies, zones and areas can be targeted for reservoir enhancement.

Examination of the Grayburg cores indicated facies ranging from deeper, outer shelf fusulinid mudstones and wackestones, to shallow shelf high energy skeletal and ooid grainstone shoals, to lagoonal mudstones, to arstified tidal flat complexes and terrigenous clastics. The core analyses of the productive intervals in the Grayburg indicated a more normal porosity/permeability distribution (3% Φ and .5md K to 10 % Φ and 10 md K). Fractures make a significant contribution to some Grayburg zones (1 to 4% Φ but up to 20 md K) and will impact the waterflood design. The simulation demonstrated that the upper Grayburg, is an excellent candidate for waterflooding. The lower Grayburg is a candidate for both additional primary production (through deepenings and new drills) and $CO_2$ or waterflooding. The San Andres portion of the reservoir is a clean, high energy packstone to grainstone sequence with karst overprinting and anhydrite infill of secondary interparticle porosity. The San Andres is highly porous with low permeabilities (3% Φ and .1md K to 14% Φ and 2md K), a function of the microvuggular nature of porosity. Despite low initial oil in place, and a long transition zone, the San Andres had good primary recoveries. This, coupled with the poor connectivity, led to conclusion that the San Andres is not a candidate for waterflooding. However, it would be a candidate for a $CO_2$ flood.

This portion of the Foster Field is representative of many Grayburg/San Andres heterogeneous reservoirs in the Permian Basin, with a 67 year production history, 5 different leases, 16 different operators and an ineffectual "waterflood" dating from 1962. This comprehensive evaluation of a small portion of a larger field by a technical team integrating subsurface geological, reservoir engineering, and 3-D seismic interpretation, resulted in recommendations for workovers, new drills, and the design of an effective waterflood. It demonstrated that cost effective, integrated studies can be undertaken by an independent operator. Workover and new drill recommendations based on the simulation results have, to date, led to the discovery of significant additional reserves. The simulation also indicated without this effort, all wellbores in the study area would have been abandoned in seven (7) years.

This cooperative study of the Grayburg/San Andres reservoir is being conducted in response to the United States Department of Energy's (DOE) Class II Shallow Shelf Carbonates Reservoirs Program.

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