


11560
Exhibit No.
Worldwide Court
Reporters, Inc.



SPE 115669

Water-Flooding Incremental Oil Recovery Study in Middle Miocene to Paleocene Reservoirs, Deep-Water Gulf of Mexico
Bin Liu, Richard Dessenberger, SPE, Kenneth McMillen, SPE, Joseph Lach, SPE, Knowledge Reservoir LLC, Mohan Kelkar, SPE, University of Tulsa

Copyright 2006, SPE

This paper was prepared for presentation at the SPE Annual Technical Conference and Exhibition, Houston, Texas, U.S.A., 29 September - 2 October 2006.

Abstract
Many deep-water Gulf of Mexico discoveries of the past five years are in water depths greater than 4,000 feet and in older Tertiary reservoirs of middle Miocene to Paleocene age (yellow dots in Figure 1). Structural styles of these lower slope fields include compressional anticlines, strike structures and sub-salt three-way dip closures against salt faces. Some of these reservoirs are highly compartmentalized by faulting. In this setting, rock compaction may be less important as a production drive mechanism, and aquifer support (possibly augmented by water flooding) assumes more significance. Porosity and permeability decrease is related to greater burial depth and compaction as well as temperature-related cementation. Older middle Miocene to Paleocene reservoirs in GoM are characterized by the following:

- Reservoirs are often at greater subsur depths: 20,000 to 30,000 ft.
- Reservoirs often have high pressure (> 15,000 psi) and temperature (> 180°F).
- Turbidite deposition was in subsiding basin floor fans, i.e. sheet sands.
- Seismic imaging is poor due to allochthonous overlying salt.
- Reservoirs are consolidated, resulting in lower rock compressibility.
- Increased diagenesis in sands with unconsolidated components results in cementation and reduced compressibility.
- Paleocene reservoirs often have poorer porosity (< 15%) and permeability (< 50 md).
- Primary recovery factors are expected to be low due to the reservoir properties.

TREX 011560.0001

SPE 115669

3. Uncertainty Parameters

A total of fourteen static and dynamic parameters are used in this stochastic study. The geologic uncertainty parameters incorporated into the static models include: structural dip, faulting, facies, aquifer size, and reservoir parameters (initial reservoir pressure, absolute permeability and heterogeneity). Dynamic uncertainty parameters include: fluid properties, water injection variables (timing and injection rates), and relative permeability variables (a function of saturation and endpoint). All the uncertainty parameters are treated as independent variables as shown in Table 2. For each parameter, high and low extreme values and medium value are determined according to the extensive study on lower Tertiary reservoirs in GoM.

Parameter	Real Values		
	Low	Medium	High
F12 Rock Comp (10E-6 1/Psi)	1	3	10

TREX 011560.0004