Exploitation and Optimization of Reservoir Performance in Hunton Formation, Oklahoma

TECHNICAL PROGRESS REPORT

Submitted by

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Contract Date: March 7, 2000
Completion Date: March 6, 2005
Reporting Period: January 1 – September 30, 2002

Work Performed Under Contract No. DE-FC26-00NT15125

Prepared for

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Objectives

The main objectives of the proposed study are as follows:

- To understand and evaluate an unusual primary oil production mechanism which results in decreasing (retrograde) oil cut (ROC) behavior as reservoir pressure declines.
- To improve calculations of initial oil in place so as to determine the economic feasibility of completing and producing a well.
- To optimize the location of new wells based on understanding of geological and petrophysical properties heterogeneities.
- To evaluate various secondary recovery techniques for oil reservoirs producing from fractured formations.
- To enhance the productivity of producing wells by using new completion techniques.

These objectives are important for optimizing field performance from West Carney Field located in Lincoln County, Oklahoma. The field, which was discovered in 1980, produces from Hunton Formation in a shallow-shelf carbonate reservoir. The early development in the field was sporadic. Many of the initial wells were abandoned due to high water production and constraints in surface facilities for disposing excess produced water. The field development began in earnest in 1995 by Altex Resources. They had recognized that production from this field was only possible if large volumes of water can be disposed. Being able to dispose large amounts of water, Altex aggressively drilled several producers. With few exceptions, all these wells exhibited similar characteristics. The initial production indicated trace amount of oil and gas with mostly water as dominant phase. As the reservoir was depleted, the oil cut eventually improved, making the overall production feasible. The decreasing oil cut (ROC) behavior has not been well understood. However, the field has been subjected to intense drilling activity because of prior success of Altex Resources.

In this work, we will investigate the primary production mechanism by conducting several core flood experiments. After collecting cores from representative wells, we will study the wettability of the rock and simulate the depletion behavior by mimicking such behavior under controlled lab conditions.

Another difficulty in producing from the Hunton Formation is the inability to correctly predict the well locations. At present, the locations of wells have been determined in a haphazard manner without significant geological consideration. To develop the entire field, it is imperative that the depositional model be clearly understood and quantified. This can be done by collecting core samples, running modern imaging logs and describing the geological facies in some detail. This will allow us to quantify the geological model, enabling a geostatistical description of lithofacies. By quantifying uncertainties in the model, the future well locations can be optimized.

West Carney Field is at the end of an exploitation phase. All the wells are under primary production. However, the pressure in the reservoir is decreasing and eventually some additional mechanism will have to be used to recover the remaining resources. For proper exploitation of the reservoir, it is best that we examine alternate methods of secondary recovery. One possible method we are going to investigate is huff-n-puff of gas injection. We will investigate both CO_2, methane and flue gas as possible injection fluids.

The overall project goal would be to validate our hypothesis and to determine the best method to exploit reservoirs exhibiting ROC behavior. To that end, we have completed the Budget Period I and have fulfilled many of the objectives. We have developed a viable model to explain the reservoir mechanism and have been able to develop a correlation between core and log data so that we can extend our analysis to other, yet unexploited, regions. In Budget Period II, we will continue to drill several additional, geologically targeted wells. Depending on the depositional system, these wells can be either vertical or horizontal wells. We will closely examine the secondary recovery techniques to improve the ultimate recovery from this field. In the mean time, we will continue to refine our geological and petrophysical model so that we can extend

our approach to other adjacent fields. In the Budget Period III, we will monitor the field performance and revise and refine our models to further optimize the performance.

To ensure that the technology developed in this project is communicated to a wide cross-section of interested individuals, we will undertake an aggressive technology transfer program. This will include publishing and presenting papers at various technical meetings, publishing a semi-annual newsletter and conducting technical workshops for small operators and independents at the beginning of Budget Periods II and III.

Summary of Technical Progress

No work was performed for this period. Budget Period II contract approval pending