Integrated Approach Towards
The Application Of Horizontal Wells
To Improve Waterflooding Performance

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Submitted by

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Objectives

The overall purpose of the proposed project is to improve secondary recovery performance of a marginal oil field through the use of an appropriate reservoir management plan. The selection of plan will be based on the detailed reservoir description using integrated approach. We expect that 2 to 5% of original oil in place will be recovered using this method. This should extend the life of the reservoir by at least 10 years.

The project is divided into two stages. In Stage I of the project, we selected part of the Glenn Pool field - Self Unit. We conducted cross bore hole tomography surveys and formation micro scanner logs through newly drilled well. By combining the state of the art data with conventional core and log data, we developed a detailed reservoir description based on integrated approach. After conducting extensive reservoir simulation studies, we evaluated alternate reservoir management strategies to improve the reservoir performance including drilling of a horizontal injection well. We observed that selective completion of many wells followed by an increase in the injection rate was the most feasible option to improve the performance of the Unit. This management plan is currently being implemented and the performance is being monitored.

Stage II of the project will involve selection of part of the same reservoir (Berryhill Unit - Tract 7), development of reservoir description using only conventional data, simulation of flow performance using developed reservoir description, selection of an appropriate reservoir management plan, and implementation of the plan followed by monitoring of reservoir performance.

By comparing the results of two budget periods, we will be able to evaluate the utility of collecting additional data using state-of-the-art technology. In addition, we will also be able to evaluate the application of optimum reservoir management plan in improving secondary recovery performance of marginal oil fields.

A successful completion of this project will provide new means of extending the life of marginal oil fields using easily available technology. It will also present a methodology to integrate various qualities and quantities of measured data to develop a detailed reservoir description.
Summary of Technical Progress

In the last three months, we are busy implementing the reservoir management plan in the field. Six wells have been completed and stimulated. The production at the beginning of the reservoir implementation plan was in the range of 13 to 15 bbls/day. At present, the production has increased by additional 13-15 bbls/day. This production is fairly steady over the last two months. We expect that as other wells are completed and stimulated, the overall production from the Unit will increase even further. Simultaneously, we are also implementing a new water injection system so that we can increase the water injection rate. The system is in place and will be operational in a few weeks.

Stage II Project

Effective September 1, we started working on the Stage II of the project. The collection of data (core, log, maps, production data) has begun and should be completed by the end of November. We expect to have the preliminary analysis completed by the end of next quarter.

Crosswell Seismic

Although the project is in the evaluation stage for the recompletion plan, work continues on the crosswell seismic data acquired in 1994. As outlined in the 1994 Annual Report, velocity anisotropy is an important issue at the project site. Unfortunately, no academic or government tomography code was available which can incorporate anisotropy effects. However, a new faculty member in the Geosciences department (D. Epili) has a general purpose seismic imaging code which can be modified to include anisotropy. This modification will be done by the geophysical PhD (G. Bozkurt) student supported on the project. It is still our opinion that crosswell traveltime tomography is of insufficient resolution to constrain the geological interpretation, but by including anisotropy effects we hope to deliver the best tomography result consistent with the data.
3D Seismic

A 3-Dimensional surface seismic survey is currently being acquired on part of the Glenn Pool field, including the W. B. Self Unit. This survey was organized by C. Liner of the University of Tulsa on the basis of in-kind contributions by Uplands Resources, The University of Tulsa, Mercury International Technology, and Nemeha Resources.

A 3-D seismic survey is currently proposed to be shot over part of the Glenn Pool field, including the W. B. Self Unit. The total area of the survey will be approximately 10 square miles. Although related to the ongoing DOE research project involving Uplands Resources and The University of Tulsa, this seismic survey is to be acquired, processed, and interpreted through in-kind contributions and without use of DOE funds. The market value of the survey is approx. $300,000.

The objective is to acquire (Nemeha), process (MIT), and interpret (TU) a 3-D seismic survey over an area including and extending beyond the Self Unit.

Specific interpretation objectives include: (1) analysis of the Glenn Sand interval for evidence of channels and/or reservoir quality indicators, (2) structural interpretation of the Wilcox formation, (3) structural interpretation of the Arbuckle formation.

With the growing trend toward 3-D seismic use in all phases of exploration and production, we feel this project will serve as a example and a stimulus to 3-D work in the shallow oil province of Northeastern Oklahoma. It is our intention to hold the data confidential for a period of one year commencing at the time acquisition is complete. However, in this period certain portions of the data may be shown by the partners for purposes of advertising and/or technical presentation. Beyond the one year confidentiality period, the data may be released whole or in part at the discretion of each partner individually.

This is an important project that should benefit all parties involved, and enhance the existing DOE Glenn Pool project.
Technology Transfer Activities

Based on the results of the Stage I of the project, several presentations have been made to report the progress of our effort. Two papers and one poster session was presented in the Mid-Continent American Association of Petroleum Geologists Meeting in Tulsa during October 8-10, 1995. During the same week, a paper was also presented at the Annual SEG Meeting in Houston, TX. A poster will be presented in the Annual SPE Meeting in Dallas, TX during the week of October 23 -25, 1995. In addition, we will also participate in the traveling workshop series organized by Petroleum Technology Transfer Council which will demonstrate the success of various Class I projects to the independent operators.