This project demonstrates the application of Advanced Secondary Recovery (ASR) technologies to remedy producibility problems at the North Robertson (Clearfork) Unit, in Gaines County, Texas. The North Robertson (Clearfork) Unit is a Shallow Shelf Carbonate (SSC) reservoir of Permian-Leonardian age operated by Fina Oil and Chemical Company. The Department of Energy (DOE) has selected the Unit as a Mid-Term Field Demonstration under the DOE Class II Oil Program.

PRODUCIBILITY PROBLEMS

Important producibility problems exhibited at the North Robertson (Clearfork) Unit include:

1. Poor sweep efficiency due to a large, low permeability reservoir interval that is heterogeneous and compartmentalized, which results in poor vertical and lateral continuity of reservoir flow units.

2. Poor balancing of injection and production rates in certain areas of the reservoir which indicates poor pressure and fluid communication and limited repressuring—possibly remedied by improved injection and production scheduling as well as injection and production well pattern re-alignments.

3. Both injection and production wells are not optimally completed with regard to placement of perforations and the stimulation treatment is inadequate for optimal production and injection practices.

RESERVOIR MANAGEMENT STUDY AREAS

To characterize the reservoir in terms of petrophysical properties and well deliverabilities (production potential), three different areas for focused study at the North Robertson Unit have been identified. These areas are known as Pre-Demonstration Reservoir Management Study Areas or PDSAs and were established based on varying performances of historical oil production, from excellent to poor. These areas will serve as intense areas of study, with testing optimization, simulation and forecasting, and surveillance activities during the project.

ADVANCED RECOVERY TECHNOLOGIES

The Advanced Secondary Recovery technologies to be demonstrated at the North Robertson (Clearfork) Unit include:

1. Development of an integrated reservoir description created using reservoir characterization and reservoir management activities—and integration and modelling of the data from these activities using geostatistical interpretations (realizations), 3-dimensional reservoir simulation, and analytical solution methods.

   - Acquisition and analysis of geological data: core and well log data.
Acquisition and analysis of geophysical data: cross-borehole tomography and interwell reflection profiling surveys.

Acquisition and analysis of engineering data: injection and production data, well test data, tracer surveys, and production logging surveys.

2. Development of an integrated reservoir management plan.

- Optimization of completion and stimulation practices to maximize production and injectivity.
- Reservoir surveillance to verify and revise the integrated reservoir description and to monitor the Field Demonstration.
- Integration of optimization and surveillance activities along with the integrated reservoir description to create provisions for future exploitation and tertiary recovery.

3. Field demonstration of the Geologically Targeted Infill Drilling (and waterflood) program developed using the integrated reservoir description and the integrated reservoir management plan.

STRATEGIC VS. BLANKET INFILL DRILLING

The primary focus of this project is to target the infill wells such that only wells which will recover significant and sustainable rates of oil flow will be drilled. Approximately 650-950 bbls of oil per day from as many as 18 new infill wells is expected to be recovered through the life of this project. Unitwide implementation of this Geologically Targeted Infill Drilling concept is expected to ultimately yield an incremental recovery of 6 to 8 percent of original-oil-in-place (OOIP) or about 16.5 to 22 million bbls of oil.

PROJECT TEAM

To accomplish the ambitious goals of this project, a team of experts who specialize in the various areas of technology that will be demonstrated have been assembled. The management and administration of the project will be handled by Fina Oil and Chemical Company from its Western Division offices in Midland, Texas. The team members and their respective activities are:

- Fina Oil and Chemical Company: Management, administration, field operations, surveillance.
- Texas A&M University: Reservoir management and reservoir performance analysis.
- The University of Tulsa: Geostatistical analysis and reservoir simulation.
- David K. Davies and Associates: Geological characterization of well log and core data.
- Mobil Exploration and Producing Company U.S. and Schlumberger Well Services: Cross-borehole tomography, design, implementation, and data processing.
- University of Texas of the Permian Basin (CEED/PIA): Technology application link for independent oil and gas operators in the Permian Basin.

TECHNOLOGY TRANSFER

All team members will participate in an extensive technology transfer program that includes newsletters, technical workshops, technology application packages, publications in trade and professional journals, and presentations at technical meetings.

APPLICATIONS

This program of Geologically Targeted Infill Drilling and the concepts for the integrated reservoir description and the integrated reservoir management plan will set a standard for the continued exploitation of SSC reservoirs using ASR technologies. It is expected that these methodologies will be extended to a variety of other SSC systems, but in particular to heterogeneous, low permeability reservoir systems like the Clearfork. Finally, the activities and technologies proposed in this project will allow for better implementation and further exploitation of SSC reservoirs using tertiary EOR methods.

ACKNOWLEDGMENTS

The support of the United States Department of Energy for technology transfer activities under the Class II Oil Program is appreciated. The authors thank the management of Fina Oil and Chemical Company for their support in disseminating the results of this project to the petroleum industry.