

Demonstration of Microholes for Oil Production and Emplacement of Subsurface Seismic Instrumentation

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Goal

The chief objective of this project is to field-test a microhole drilling system capable of drilling and completing small-diameter wells. The wells will be drilled with a coiled tubing rig to lower overall exploration and production costs.

A second objective of the project is to evaluate new commercial drilling and completion equipment. The Los Alamos microdrilling equipment serves as a platform to evaluate commercial technology that is or may be appropriate for microdrilling and completion services.

Performers

Los Alamos National Laboratory (LANL)
Los Alamos, NM

Rocky Mountain Oilfield Testing Center (RMOTC)
Casper, WY

Lawrence Berkeley National Laboratory (LBNL)
Berkeley, CA

University of Wyoming
Laramie, WY

Results

The acoustic performance of the geologic formations in the CO₂ injection area has been modeled and was used to select four well locations for CO₂ flood monitoring. Seismic arrays were selected, and the equipment needed to assemble and deploy the arrays was procured.

The first micro-instrumentation CO₂-monitoring hole—one of two 800-foot microholes planned—was drilled and completed in October 2004. The 808-foot well was completed with PVC casing set below 587 feet, where intermediate steel casing was cemented to isolate the Shannon formation. The second micro-instrumentation hole was drilled to 407 feet and later similarly completed. A multi-offset, vertical seismic profile survey was conducted successfully in one of the 800-foot microholes.



Foreground: LBNL microgeophone array sonde in the deployment cable.
Background: contract vibroseis unit.

Benefits

The overall objective of this project is to demonstrate the technical and economic feasibility of a highly mobile, self-contained, microhole drilling system as an enabling technology for commercially viable seismic-data acquisition. Succeeding in these objectives will result in reduced well cost and improved quality of data. Air-filled microholes completed with PVC (or other nonmetallic casing) are expected to provide the lowest noise environment possible for retrievable seismic instrumentation.

Background

The use of production and injection wells for seismic data acquisition has a number of disadvantages. Deploying seismic sensors and other logging-type tools interrupts field operations, resulting in loss of money through temporarily stopped production and idle time for expensive equipment and personnel. Production and injection wells often are not positioned in the most advantageous locations for obtaining reservoir data. Conventional wells dedicated to seismic monitoring are expensive to drill.

Microholes (wellbores less than 3/2-inch diameter) have the advantage of being relatively inexpensive to drill, and locations and completion designs can be selected for optimal acquisition of seismic data.

Summary

This project will 1) investigate the feasibility of installing 3/4-inch coiled tubing on the LANL coiled tubing unit to extend microhole depth capability to 1,500 feet; 2) improve the performance of the LANL low-cost, highly portable, micro-sized cement mixing equipment and displacement pumps; 3) demonstrate a low-cost micro-wellhead concept for production; and 4) complete a demonstration microhole production system at RMOTC.

Current Status (January 2006)

Completion of the second monitoring well and drilling and completion of two additional microwells began in spring 2005. The high-resolution seismic data are being processed. CO₂ injection is presently scheduled to begin in late 2006.

Project Start / End: 7-8-04 / 7-7-06
DOE / Performer Cost: \$705,000 / \$0
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