PROGRAM facts

U.S. DEPARTMENT OF ENERGY
OFFICE OF FOSSIL ENERGY
NATIONAL ENERGY TECHNOLOGY LABORATORY

Strategic Center for Natural Gas and Oil

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OIL EXPLORATION & PRODUCTION PROGRAM MICROHOLE TECHNOLOGY INITIATIVE

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Background

An estimated 407 billion barrels of onshore discovered oil in the US is non-recoverable with current drilling and production technologies. Of that total, 218 billion barrels can be found at the relatively shallow depths of 5,000 feet or less. Even at today's high oil prices, industry-sponsored research remains on the decline, and operators tend to use familiar technologies rather than risk failure with advanced technology. To bridge this technology gap, DOE partners with industry to develop and demonstrate promising new technologies to access domestic petroleum resources.

The Microhole Technology (MHT) Initiative addresses a promising suite of technologies that has the potential to reduce the cost of drilling shallow- and moderate-depth holes for exploration, field development, long-term subsurface monitoring, and to a limited degree, actual oil and gas production. If the costs of these activities can be reduced, oil and gas reservoirs that are uneconomic to produce today could become economically viable in the future.

The MHT Initiative was based in part on miniaturization of seismic sensors, microhole coiled tubing rig development, and feasibility studies conducted by Los Alamos National Laboratory and its industry partners. The successful feasibility study and demonstration of coiled-tubing-deployed microdrilling provided a promising indication that microholes could assume an important role in increasing recovery from domestic oil and gas fields.

Description

The goals of DOE's MHT initiative are to develop technologies that enable:

- Development of shallow (<5,000 feet), currently uneconomic oil and gas resources.
- Acquisition of high-resolution, real-time reservoir information without interrupting production.

The MHT Initiative is developing a suite of technologies that enable coiled tubing drilling of 3½-inch and smaller boreholes using small, portable coiled tubing drill rigs. The current program focus is on:

Field demonstrations of existing 4¾-inch commercial microhole technology and applications in various regions of the U.S.

Built-for-purpose microhole coiled tubing rigs that can drill 1-inch through 2⅜-inch coiled tubing boreholes with low-density compressible drilling fluids.

Self-contained zero-discharge drilling mud systems that are truck-, trailer-, or skid-mounted and meet DOT limitations.

ADDRESSES

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Microhole coiled tubing bottomhole assemblies incorporating measurement while drilling, logging while drilling, directional assemblies, and positive displacement motors suitable for drilling 3-inch boreholes.

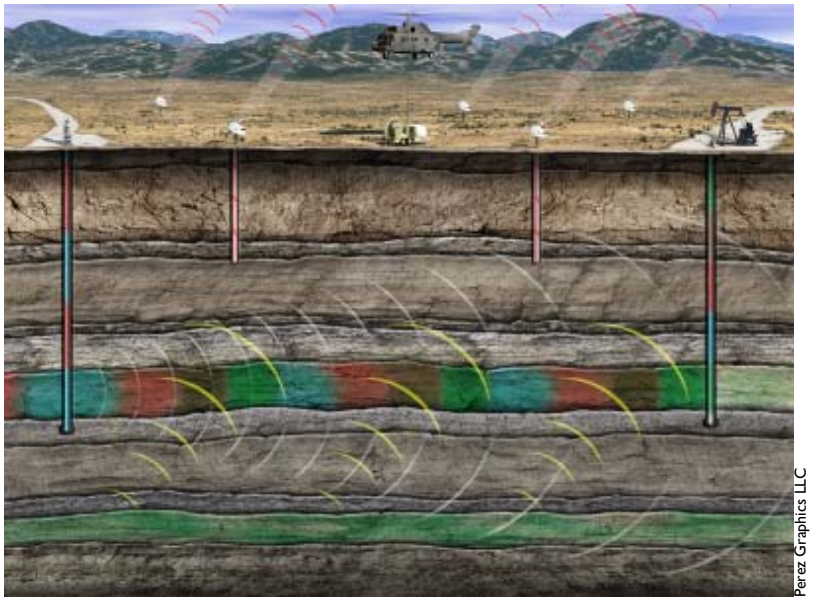
Microhole completion and production equipment.

Expected MHT applications include drilling:

- Shallow development wells with one third the space and one third the number of equipment loads when compared with a rotary drilling rig.
- Dedicated reservoir monitoring wells for 4-D seismic imaging of reservoir fluid movement and bypassed oil. Data collection will not disrupt production, and the wells can be located at optimum locations.
- Shallow re-entry single or multiple lateral boreholes that allow "deep" perforations, imaging of lateral variations of reservoir properties by seismic array deployments, and vertical flooding projects. These efforts could significantly increase recovery—especially in mature Midcontinent fields that could be returned to profitable operations.
- Deep exploration tails to existing wells that can cheaply extend the wellbore to evaluate zones just below the target zone of interest.

Benefits

The MHT Initiative's benefits to the Nation include lower drilling costs from reduced materials, labor, and support equipment; reduced environmental impact from less drilling waste, smaller footprints, and increased transportability in remote, fragile terrains; decreased finding costs by proving exploration targets more economically; improved high-resolution, real-time reservoir information from dedicated boreholes with permanently installed reservoir monitoring systems; and better control over data collection locations rather than using existing production and injection wells.



Helicopter-transportable coiled tubing rig can be used to drill low-cost microhole observation wells to monitor movement of subsurface fluids, such as this CO_2 flood.