

Field Demonstration of Existing Microhole Coiled Tubing Rig

DE-PS26-04NT15482

Goal

The project goal is to field-test a state-of-the-art microhole coiled tubing drilling (CTD) rig and to conduct technology-transfer efforts to generate interest in and gain acceptance of the technology. Utilization of this technology will enable development of marginal oil and gas wells while minimizing environmental impact.

Performers

Gas Technology Institute
Des Plaines, IL

Rosewood Resources
Dallas, TX

Results

This project has demonstrated the advantages of microhole and CT drilling and documented the advantages and economic benefits when compared with conventional drilling. Dissemination of these results through publications and presentations will facilitate expanded use of this technique.

Twenty-three gas wells have been drilled and completed in the mature play of the Niobrara formation of western Kansas and eastern Colorado. A total 40,000 feet of 4³/₄-inch hole was drilled, ranging in depth per well from 1,500 feet to 3,100 feet. Each of the wells was monitored for rig performance, including rate of penetration, time for rig mobilization, and other parameters.

The small size of the rig resulted in several environmental advantages, including small drilling pads of 1/10th acre and the absence of mud pits where tanks were used to store and move drilling fluids.

The performance of the drilling rig has continuously improved throughout the project. Initially, 1,500-foot Niobrara wells were drilled in one day. Currently, 3,000-foot Niobrara wells are being drilled in 19 hours, including move-in, rig-up, drilling, logging, setting casing, cementing, and rig-down move-out. Rate of penetration (ROP) was as high as 500 feet/hour, with an average ROP per well of 400 feet/hour. The wells drilled resulted in a gauge hole with little hole deviation.



This coiled tubing drilling rig has drilled over 40,000 feet of 4³/₄-inch borehole. The project garnered nominations as a finalist in the 2005 World Oil Awards and for Operator of the Year by the Colorado Oil and Gas Commission in 2005.

The overall rig performance has led to a new approach for marginal gas fields. Wells that encounter thin pay with gas-water contacts near the perforated interval are being designed for production without hydraulically fracturing. This approach, if proven successful, will allow production of previously non-producible gas reserves.

Benefits

Based on Coiled Tubing Solutions' (CTS) drilling experience with CT rigs in Kansas, Montana, Texas, and Canada, microhole technology can cut the drilling cost of wells by up to 38%. The reduced cost translates to \$55,000 cost savings per 1,200-foot well. The CTS rig design provides technical advances over existing drilling systems in seven areas: reduced drilling cost, low mobilization/demobilization times, improved pipe-handling, increased safety, measurement-while-drilling, reduced environmental impact, and increased wellbore transmissivity.

Background

Currently, about 800 wells are drilled per year using coiled tubing in the United States, with the potential for a much larger number if CTD becomes a proven tool. In addition, the cost savings and rig design

with CTD are likely to facilitate additional production through the development of resources that are uneconomic at current drilling costs. The most significant economic impact will be the additional oil and gas resources that will be made available to U.S. consumers.

Summary

In this project, a next-generation microhole CTD rig is being field-tested. The rig being used is the MOXIE experimental rig fabricated by ATD/CTS specifically for microhole CTD to depths as great as 5,000 feet.

Sites in Kansas and Colorado that have known gas resources at 1,200-3,500 feet in depth are being drilled and cased with the microhole CTD rig. The rig is being evaluated in six areas: mobilization and rig-up time, drilling surface and production holes, running surface casing and cementing, logging and evaluation, running production casing and cementing, and rigging down and moving the equipment from the drill-site. Measurements are being made of time, equipment weight, penetration rates, rpm, torque, drag, pumping pressures, mud properties, solids control, and other measures of rig performance.

During the early field testing and monitoring of the microhole CT rig, the percentage of time for each operation was calculated. Operations considered included rig-up time, 9%; pick-up of bottomhole assembly (BHA), 9%; drilling, 26%; lay-down of the BHA, 9%; logging, 17%; and casing/cementing, 30%. The relatively low drilling time illustrates the advantage of using CTD where the drillpipe connection is eliminated when compared with conventional drilling. The average rate of penetration for the initial eight wells drilled was 204 feet per hour.

Current Status (January 2006)

All of the field work has been completed. Twenty-three project wells were monitored in the field with over 40,000 feet of 4³/₄-inch hole drilled. The project contract required only three wells and 1,000 feet of 4³/₄-inch hole be drilled.

Project Start / End: 2-7-05 / 2-6-06

DOE / Performer Cost: \$999,794 / \$1,000,000

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