Friction Reduction for Microhole Coiled Tubing Drilling

DE-FC26-05NT15485

Goal

The project will create a robust, economical microhole coiled tubing drilling (CTD) friction reduction system that will enable the drilling of wellbores with 3,000 feet or more of horizontal displacement in a 3½-inch wellbore without the use of any other downhole coiled tubing friction mitigation device.

Performer

CTES
Conroe, TX

Results

Selected Phase 1 accomplishments for this report period include the following:

- Researchers completed vibration test fixture fabrication and instrumentation.
- "Free-ended" vibration energy tests were performed over a continuous frequency range of 20-60 Hz for axial, torsional, lateral, and circular vibration modes.
- Test fixture results indicate that vibration energy transmission coefficients increase as vibration frequency is increased.
- Axial vibration modes provided for significantly better vibration energy transmission coefficients versus other modes. Notably, torsional vibrations yielded slightly better results than circular or lateral vibration.

Benefits

The primary benefits resulting from this project will include 1) drilling-cost reduction resulting from the use of less-expensive CTD for long, horizontal wellbores; and 2) the ability to develop additional hydrocarbon reserves in a more environmentally friendly manner due to the smaller footprint associated with a CTD rig.

Background

A key barrier hindering increased utilization of CTD for inclined/horizontal wells is the cost of overcoming downhole friction when attempting to drill long (>2,000 feet) horizontal sections. When drilling these long laterals, the downhole friction forces reach such high levels that the drilling operation is stopped prematurely, or a costly downhole drilling tractor must be used to help pull the coiled tubing at the bottom of the well in order to continue drilling.

The current approach to reducing downhole friction involves the application of downhole vibrators or drilling tractors. Both of these technical approaches have significant limitations. Vibrating pipe to mitigate friction is a proven technology for conventional "jointed" drillpipe operations. However, CTD surface equipment is significantly different from that of a conventional drilling rig. This difference limits the ability to apply some of the existing types of vibration.

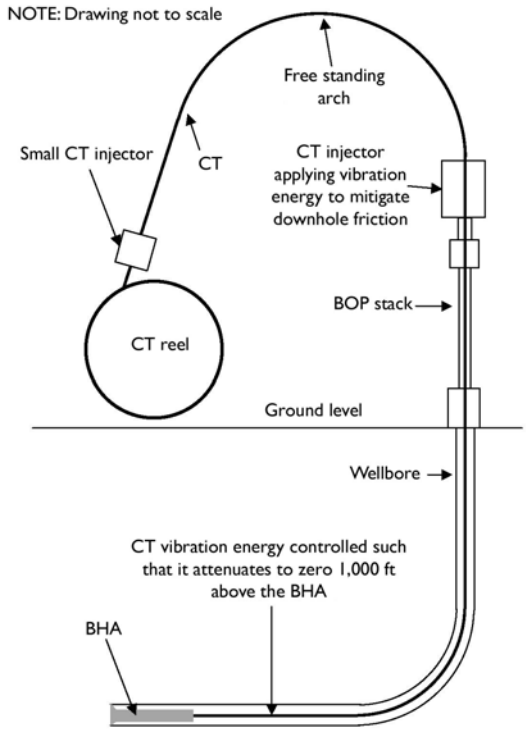
Summary

The project consists of two 12-month phases, with a Go/No Go decision point at the conclusion of the initial phase. Phase 1 work contains four major tasks, including development of a software model to predict downhole vibration attenuation versus depth, engineering and construction of a vibration test fixture, testing and validation of the vibration attenuation model in the vibration test fixture, and conceptual design and optimization of a full-scale friction-reduction system.

Phase 2 work also encompasses four tasks, including finalizing design of the friction-reduction surface equipment, fabricating surface equipment, component-testing surface equipment, and field-testing the complete friction-reduction system.

Current Status (January 2006)

The project is on schedule to complete all Phase 1 tasks by early second quarter 2006. Testing in the vibration test fixture is ongoing. These data will be used for software model validation. Vibration test fixture results also will be used to identify the optimum vibration mode to be used in the conceptual design of a friction-reduction system that could be utilized in the field.



Microhole coiled tubing drilling friction reduction system for horizontal wellbores.

Project Start / End: 4-1-05 / 3-31-07
DOE / Performer Cost: $756,570 / $189,140
Contact Information:
NETL – Virginia Weyland (virginia.weyland@netl.doe.gov or 918-699-2041)
CTES – Edward Smalley (ed.smalley@ctes.com or 936-521-2222)