PROGRAM facts

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

Strategic Center for Natural Gas & Oil

07/2005

COMPOSITE DRILL PIPE – BRINGING NEW LIFE TO THOUSANDS OF IDLE WELLS

Composite drill pipe (CDP) could bring new life to thousands of idle wells drilled in the early 20th century. In most oil and gas fields throughout the U.S., many zones above or below the targeted formation were bypassed because the reserves were not considered significant when the well was drilled. Using short-radius composite drill pipe to drill a horizontal well into these formations could bring many of these older wells back into production without the environmental disturbance that drilling new wells from the surface would create. Field tests during DOE's project and use of the composite pipe since then have shown that the CDP has better resistance to the extreme bending conditions placed on the drill pipe during drilling operations.

In addition to its application to short-radius drilling, CDP shows promise for enabling the economic development of oil and gas resources in other challenging locations. Because CDP combines light weight (less than ½ the weight of steel) with the performance properties of steel pipe, it is considered one of the technologies needed for resource development in extended reach, ultra deep, and deep directional drilling applications.

Composite Pipe

Composite materials made of carbon fibers and epoxy resin could offer mechanical properties comparable to steel at less than half the weight. Pipe made from such composite materials offer superior flexibility for drilling the short radius well bores required to extend horizontal laterals at shallow depths. It could also facilitate high-speed data transfer via cables or fiber optic leads embedded within the body of the pipe during construction. As carbon composites are becoming less expensive to manufacture, the opportunity exists to develop a composite drill pipe (CDP) with some or all of these features that is cost competitive with steel. Also, because the mechanical properties of composites are well established and are a function of the types of resins and fibers used and the amount and orientation of fiber, sections of CDP can be optimized for specific applications.

A 30-ft joint of SR-CDP pipe can be easily lifted

CONTACTS

Brad Tomer
Director
Office of Natural Gas
304-285-4692
brad.tomer@netl.doe.gov

James Ammer
Director
Gas Technology Management Division
304-285-4383
james.ammer@netl.doe.gov

Gary L. Covatch
Project Manager
Gas Technology Management Division
304-285-4589
gary.covatch@netl.doe.gov

Successful Field Tests

The first test, conducted by Grand Resources, Inc. of Tulsa, OK, used the pipe to re-enter an existing vertical well that had stopped producing in 1923. Just below 1,200 feet, using 2½-inch diameter short-radius (SR)-CDP, drillers successfully kicked off a new borehole that curved into a horizontal lateral that extended 1,000 feet. SR-CDP was also used by J.B. Drilling in Leflore County, OK to drill a 60-foot radius, 1,000-foot lateral through hard and abrasive sandstone from a new natural gas well drilled to a depth of 1,385 feet. The SR-CDP was used with air-hammer drilling tools to convincingly test its fatigue life and mechanical strength. Five, 30-foot joints of SR-CDP were run for a total of more than 160,000 cycles at an average RPM of 70, air pressure of 300 psi, and torque of 1,000 lb-ft. After a week of drilling, the pipe showed little to no signs of wear.

Commercial Orders

Torch International has placed an order for 1,000 feet of the short-radius composite drill pipe. Torch also informed ACPT that they would be placing another order for 1,000 feet in about 60 days**.** ACPT is working closely with Omsco, a unit of ShawCor Ltd., to determine the required extent of pilot plant upgrade and the commercial basis for building a full scale, continuous operation CDP production unit. At a future time, a full scale manufacturing plant will be installed to expand production rates and to allow production of a premium grade of CDP with even higher strength to weight ratios.

30-ft lathe for performing finish machining with SR-CDP joint in place

ADDRESS

National Energy Technology Laboratory

626 Cochrans Mill Road
P.O. Box 10940
Pittsburgh, PA 15236-0940
412-386-4687

3610 Collins Ferry Road
P.O. Box 880
Morgantown, WV 26507-0880
304-285-4764

One West Third Street, Suite 1400
Tulsa, OK 74103-3519
918-699-2000

P.O. Box 750172
539 Duckering Bldg./UAF Campus
Fairbanks, AK 99775-0172
907-452-2559

CUSTOMER SERVICE

1-800-553-7681

WEBSITE

www.netl.doe.gov