Advanced Monobore Concept CFEX Self-Expanding Tubular Technology

DE-FC26-05NT15483

Goal

The goals of this project are to prove technical, economic, and manufacturing concepts for innovative, self-expanding casing technology for monodiameter wells and to successfully deploy a small section of the casing in a demonstration well.

Performers

Confluent Filtration Systems
Houston, TX

AMET, Inc.
Rexburg, ID

Southwest Research Institute
San Antonio, TX

Results

Progress was made in the design of a more efficient, mechanically robust, and economically feasible self-expanding well casing system for use in both microhole and conventional drilling.

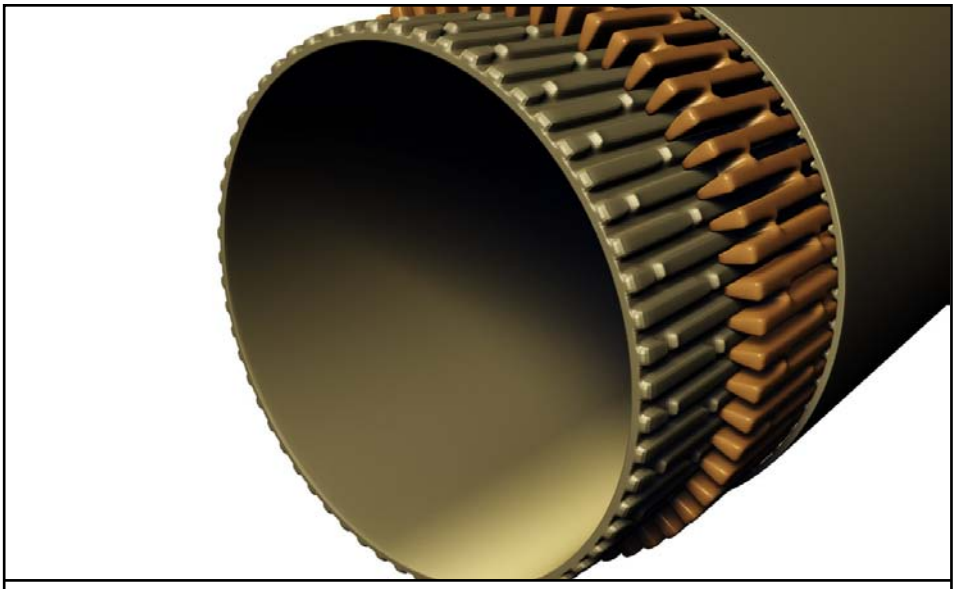
Benefits

The development of expandable casing for monobore wells promises to reduce drilling risks and improve economics throughout exploration and production. Self-expanding technology allows reduction of hole volume, increased inside-diameter production tubing, shortened field schedules, and minimized drillsite footprint. The technology is well-suited for drilling and casing microholes with tight annular spaces.

Background

Current expandable tubular technology relies on fluid pressure to plastically deform the tubular. A fundamental problem with deforming steel is that the process requires shrinkage along its other dimensions. Irregularities in tubular chemistry and wall-thickness—coupled with more-irregular borehole conditions, including excess bend severity, diameter restrictions, and non-concentricity—further reduce current tubular expansion reliability.

Current expandable tubular technology is not feasible for microhole coiled tubing drilling because the pressures required to expand the tubulars are too great.



Elastomer ridges in a self-expanding casing.

This project is developing an expandable casing that consists of pre-stressed cells that eliminate shrinkage and don't require pressure for deployment.

Summary

The expandable casing being developed in this project consists of volumetrically adjustable cells (honeycomb structures) that are compressed to reduce the outside diameter. The reduced size is held in place by temporary metallurgical bonds established between various interior "cell-spring" surfaces. Once inserted into the wellbore, those stabilizing bonds are removed by specific chemical or mechanical activity, and the casing recovers to near its original dimensions.

Tasks of the project include the following:

- Concept development, which includes the development of user definitions and performance measures, basic research of specifications, and detailed qualitative evaluation of prospective design concepts.
- Design optimization, which involves the use of computer analytical methods, design by analysis routines, finite-element analysis, and 3-D geometry export for computer-aided machining.
- Prototype construction, which will include construction of a variety of prototypes to be used in physical tests and field demonstrations.
- Physical testing, which entails conventional laboratory evaluation of mechanical performance against theoretical properties.
- Manufacturing study, which will include research, evaluation, and conceptual development of various methods of joining and forming materials
- Field demonstration, which calls for deployment of a prototype section in a test well.

Current Status (January 2006)

During late 2005, the best of several design concepts was selected for optimization and planned prototyping. The chosen design is capable of 200% expansion and indefinite pressure capacity. Interest in the new technology has been expressed by private investors and major companies with a view towards rejuvenating maturing fields. The next project milestone is completion of design optimization and detailed design phases, to be followed by prototype construction.

Project Start / End: 2-7-05 / 8-31-07
DOE / Performer Cost: $975,644 / $270,600
Contact Information:
NETL – Paul West (paul.west@netl.doe.gov or 918-699-2035)
Confluent Filtration – Jeffery Spray (jaspray@earthlink.net or 281-597-8784)