

DOWNHOLE VIBRATION MONITORING & CONTROL SYSTEM QUARTERLY PROGRESS REPORT #18

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ABSTRACT

The objective of this program is to develop a system to both monitor the vibration of a bottomhole assembly, and to adjust the properties of an active damper in response to these measured vibrations. Phase I of this program, which entailed modeling and design of the necessary subsystems and design, manufacture and test of a full laboratory prototype, was completed on May 31, 2004.

The principal objectives of Phase II were: more extensive laboratory testing, including the evaluation of different feedback algorithms for control of the damper; design and manufacture of a field prototype system; and, testing of the field prototype in a drilling laboratory. Phase II concluded on January 31, 2006, and the Phase II final report was issued.

Work on Phase III of the project began during the first quarter, 2006. Efforts the current quarter have continued to focus on the manufacture of the prototype and precommercial parts, field test planning and commercialization.

The continued extreme lead times quoted by oilfield machine shops for collar components significantly delayed the deployment of the prototype and precommercial units. All parts have now been received for two units, and all but one for the third. Mechanical assembly of the first two systems is complete and the electronics installation and laboratory testing will be finished in April.

We have entered into a Memorandum of Understanding with a major US oilfield equipment supplier, which calls for their assisting with our field tests, in cash and in kind. We are close to signing a definitive agreement which includes the purchase of the three precommercial units. We had also signed a CRADA with the Rocky Mountain Oilfield Test Center (RMOTC), and scheduled a test at their site, The RMOTC drilling schedule continues to slip, and the test cannot begin until the first week of May.

Based on these factors, we have requested a no-cost extension to July 31, 2007.

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Executive Summary

The objective of this program is to develop a system to both monitor the vibration of a bottomhole assembly, and to adjust the properties of an active damper in response to these measured vibrations. Phase I of this program, which entailed modeling and design of the necessary subsystems and design, manufacture and test of a full laboratory prototype, was completed on May 31, 2004.

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.Design

Redesign of laboratory prototype

COMPLETE.

Design of feedback system

COMPLETE.

Intermediate prototype design

COMPLETE

Design of field prototype tool

COMPLETE

Design of precommercial prototype tool

COMPLETE

Experimental

Retesting of DVMCS prototype

COMPLETE

Preparations for Testing at TerraTek

COMPLETE

Testing at TerraTek Drilling Laboratory

COMPLETE.

Manufacture of Prototype and Precommercial Tools

As discussed in earlier reports, we have telescoped the prototype and precommercial phases to expedite entry into the market. We are in the process of manufacturing three precommercial prototypes for testing in the field. Our commercial partner has agreed to support this testing with personnel, equipment (especially, bits) and will, once a definitive agreement is signed, purchase the precommercial tools after the testing.

During this quarter, we received the parts required to assembly three tools. During assembly, one key part was damaged, and we proceeded to assemble the other two tools, which are required for the field test. Both were nearly com-

plete at the end of March. [After the end of the quarter both were completed and tested in the flow loop. They were shipped to RMOTC on April 27.]

Preparation for Field Testing

The flow loop fixtures are complete and installed on the flow loop. [After the end of the quarter, the tools were tested in the flow loop.]

Field Testing

We have signed a CRADA with RMOTC were planning to do the first field test there, beginning on January 15, 2007. RMOTC have since informed us that their drilling schedule has slipped and the earliest the test can begin is during the first week of May.

Analysis

TerraTek data

COMPLETE.

Commercialization

We have signed a Memorandum of Understanding with a major international oilfield equipment supplier based in the US. This MOU provides support for our field testing through the provision of bits and manpower, as well as financial support. In addition, once a definitive agreement is signed, the company will buy the three precommercial prototypes. [A final agreement was signed after the end of the quarter.]

We are currently in negotiations with Sandia National Laboratory regarding a possible non-exclusive license to their related technology. [The agreement was signed after the end of the quarter.]

Units

To be consistent with standard oilfield practice, English units have been used in this report. The conversion factors into SI units are given below.

$$1 \text{ ft.} = 0.30480 \text{ m}$$

$$1 \text{ g} = 9.82 \text{ m/s}$$

$$1 \text{ in.} = 0.02540 \text{ m}$$

$$1 \text{ klb.} = 4448.2 \text{ N}$$

$$1 \text{ lb.} = 4.4482 \text{ N}$$

$$1 \text{ rpm} = 0.01667 \text{ Hz}$$

$$1 \text{ psi} = 6984.76 \text{ Pa}$$