DOWNHOLE VIBRATION MONITORING & CONTROL SYSTEM
QUARTERLY PROGRESS REPORT #12

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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 are: 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 drilling laboratories and test wells.

Work during this quarter centered on the rebuilding of the prototype using the improved valve design described in the Jan-March report[1]. Most of the components have been received and assembly was nearly complete at the end of the period. Testing started in October and results will be submitted in the next report.

The field testing component of this Phase has been rethought. The current plan is to adapt the laboratory prototype for use in a drilling laboratory and run a series of controlled drilling tests with and without the DVMCS. This should give a more quantitative evaluation of its value, which will help us sign a commercialization partner. While this testing is underway, we will order and begin machining parts for full field prototypes to be use in Phase III.

A modification application is being submitted in October to reflect these changes.

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Executive Summary

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Design

Redesign of laboratory prototype

Complete. The redesign valve now has the coils located in the non-reciprocating portion of the tool. This lends itself to a more reliable electrical connection and better protection of the coils from the abrasive MR fluid.

Design of feedback system

The algorithms are installed in the system.

Field prototype design

The redesign was completed last quarter.

Experimental

Retesting of DVMCS prototype

The reworked prototype was essentially complete at the end of the quarter. Testing will begin in October.

Analysis

No further analysis was performed during this quarter.

Other

A "bottom up" economic model was prepared for the DVMCS. In this model, typical drilling costs are input for the particular market. Some basic assumptions are made about the improvement provided by the DVMCS, how these savings are to be shared by the service company and its clients, to generate an anticipated revenue per job. The estimated number of jobs per year is also estimated.

To estimate costs, we include: cost of purchasing the units; number of units needed to support one job; cost of money; anticipated repair costs and schedule; overhead, *etc*. On this basis, one can calculate the ROI and payback period for our customer (*i.e.*, the oilfield service or supply company) on purchasing systems. Preliminary calculations show that, with reasonable, conservative assumptions, the DVMCS represents a very attractive investment, even for simple vertical well drilling. In deep, hard rock or offshore drilling the paybacks are enormous. This model will be refined and presented in the final report.

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 ft.	=	0.30480 m
1 g	=	9.82 m/s
1 in.	=	0.02540 m
1 klb.	=	4448.2 N
1 lb.	=	4.4482 N
1 rpm	=	0.01667 Hz
1 psi	=	6984.76 Pa

References

[1] APS Technology, Inc., "Downhole Vibration Monitoring & Control System Quarterly Progress Report #10," DE-FC26-02NT41664, 27 April, 2005.