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PROGRESS REPORT

No. 9

DEVELOPMENT OF

IMPROVED BLOWOUT PREVENTION PROCEDURES

TO BE USED IN DEEP WATER DRILLING OPERATIONS

Submitted To

THE UNITED STATES GEOLOGICAL SURVEY

Department of the Interior

Reston, Virginia

PETROLEUM ENGINEERING DEPARTMENT

LOUISIANA STATE UNIVERSITY

Baton Rouge, Louisiana 70803

May 15, 1981

PROGRESS REPORT

February 16, 1981 - May 15, 1981

Development of Improved Blowout Prevention Procedures for Deep Water Drilling Operations

Contract No. 14-08-0001-17225, Mod. 2
Effective Date: August 23, 1978
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The United States Geological Survey

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RESEARCH OBJECTIVES

The primary objectives of the proposed research are the development of improved blowout prevention procedures to be used in deep water, floating drilling operations. The overall research plan was divided into eight tasks which would take approximately four years for completion. The project funding received under the present contract is $630,789 to perform the following tasks:

Task Description

1. Design of well for accurately modeling blowout control operations on a floating drilling vessel in deep water.
   a. Well scaling and design.
   b. Preparation of bids and specifications.
2. Construction of well for accurately modeling blowout control operations on a floating drilling vessel in deep water.
   a. Procurement of well equipment.
   b. Well drilling and completion.
3. Documentation of blowout control equipment configuration and procedures used on all floating drilling vessels capable of drilling in deep water.
   a. Equipment configuration.
   b. Shut-in procedures.
   c. Start-up procedures.
   d. Pump-out procedures.

4. Experimental study of shut-in procedures for blow-out control on floating drilling vessels in deep water.
   a. Experimental determination of frictional area coefficient profile of modern adjustable chokes and HCR valves used in blowout control operations.
   b. Experimental determination of frictional area coefficient profile of modern annular blowout preventers during closure.
   c. Development of mathematical model of pressure surges during well closure.
   d. Experimental evaluation of pressure surge model.
5. Experimental study of procedures for handling upward gas migration during the shut-in period.
   a. Evaluation of conventional approach requiring use of surface drill pipe pressure.
   b. Evaluation of volumetric methods.
   c. Laboratory investigation of gas bubble fragmentation while rising in a static annulus.
   d. Development of mathematical model of well behavior during shut-in period following a gas kick.
   e. Determination of optimal method of handling upward gas migration during shut-in period.

6. Experimental study of start-up procedures for blowout control on floating drilling vessels in deep water.
   a. Evaluation of present day start-up procedures which use existing equipment.
   b. Evaluation of possible future start-up procedures which would require development of new equipment.
7. Experimental study of pump-out procedures for blowout control operations on a floating drilling vessel in deep water.
   a. Evaluation of present day pump-out procedures which use existing equipment.
   b. Evaluation of present day pump-out procedures which would require development of new equipment.

ACCOMPLISHMENTS

Task 1, well scaling and design, has been completed. Details of the design of both the well and the related surface equipment were presented in our last annual report.

Task 2, construction of the new well facility, is now almost complete. The primary remaining work is the installation of the surface controls and instrumentation. The construction should be sufficiently complete to be operational by the end of May. The first experimental data obtained using this facility will be taken in June.

Data collection for Tasks 3, 4a, 4b, and 5 are all essentially complete. However, written documentation of these tasks is still in progress. Three Master of Science (MS) theses dealing with these tasks are now in preparation.

Experimental work on Tasks 6 and 7 will begin in June, 1981. Experimental procedures for Tasks 6 and 7 are still being planned in more detail.

PROBLEMS

No significant problems have been encountered since our last progress report.

SIGNIFICANT CHANGES

No additional changes in the project are felt to be desirable at this time.