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Gas removal systems associated with dredge pump: Phase C

D. Basco

G. Bagge

R. E. Miller

J. B. Herbich

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GAS REMOVAL SYSTEM ASSOCIATED
WITH DREDGE PUMP: PHASE C

Status Report No. 12

Prepared by
David Basco
Gunnar Bagge
Robert E. Miller
and
John B. Herbich

Prepared for
U. S. Army Engineers District, Philadelphia
Corps of Engineers
Philadelphia, Pennsylvania

August, 1966

Bethlehem, Pennsylvania

CIVIL ENGINEERING DEPARTMENT
FRITZ ENGINEERING LABORATORY
HYDRAULIC AND SANITARY ENGINEERING DIVISION

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Fritz Engineering Laboratory Report No. 310.15

PREFACE

The following status report summarizes the progress made under Phase C of the project during the period June 1, 1966 to July 31, 1966, at the Hydraulic and Sanitary Engineering Division of the Fritz Engineering Laboratory, under the terms of contract No. DA-36-109-CIVENG-64-72. The progress on the study was reported in eleven status reports dated February 1964, April 1964, October 1964, December 1964, January 1965, June 1965, August 1965, October 1965, December 1965, February 1966, and June 1966. (Fritz Engineering Laboratory Report No. 310.1^{(1)*}, No. 310.2⁽²⁾, No. 310.4⁽³⁾, No. 310.5⁽⁴⁾, No. 310.6⁽⁵⁾, No. 310.8⁽⁶⁾, No. 310.9⁽⁷⁾, No. 310.10⁽¹⁰⁾, No. 310.11⁽¹¹⁾, No. 310.13⁽¹³⁾, No. 310.14⁽¹⁴⁾).

Phase A and Phase B of the project were completed and summarized in Fritz Engineering Laboratory Report No. 310.3⁽⁸⁾ (June 1964), and No. 310.7⁽⁹⁾ (February 1965) respectively.

Dr. John B. Herbich is the project director, Mr. D. Basco is the project supervisor and are assisted by Mr. G. Bagge and Mr. R. Miller, Research Assistants. Dr. L. S. Beedle is Acting Head of the Department of Civil Engineering.

* Numbers in parenthesis refer to references on pages 4 and 5 .

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I. Experimental Investigation

1. A total of sixteen medium speed movies and three high speed movies have been taken. These movies have orifice size and air content as varying parameters. A minimum of three different views of the suction pipe were used with each set of parameters to record the position of the gas bubbles. The high speed movies were taken of the pump impeller and the horizontal suction pipe into the impeller. The path of individual gas bubbles is better seen with the high speed movies but only one flow condition can be investigated with one roll of film. The medium speed movies do not show as much detail in the gas flow, but the slower film speed allows four different air contents to be investigated with one roll of film.

2. Observations were made of the suction elbow at discharges ranging up to 1000 gpm and no cavitation was visible.

3. At our 11 May meeting it was decided that in lieu of separate tests at three pump speeds a check would be made to see if dimensionless data from two other speeds plotted on the same line as data from 1440 rpm tests. When this check was made, it was noticed that a downward shift had occurred in the dimensionless plots of head versus capacity. Several check tests were made to determine the reason for the shift. Since even the check tests at 1440 rpm displayed the shift, it was thought that some error was present in our instrumentation. Tests with a Hasler speed indicator showed that the tachometer generator mounted on the pump motor was in error by 7.0% at 1440 rpm. The tachometer generator was removed and a new series of tests using the

Hasler speed indicator. This new data is now being plotted and it appears that the data from tests run at 1300 and 1600 rpm pump speed is in close agreement with the data obtained at 1440 rpm.

II. Equipment Orders

1. Equipment received
 - a. Vacuum pump, Ingersoll-Rand, 2 hp., single stage reciprocating type
 - b. Inlet pipeline filter for vacuum pump
 - c. Magnetic starter, General Electric
 - d. Level trol, Fisher type 2500-249
 - e. Diaphragm Actuator, Fisher type 667

2. Equipment ordered
 - a. Scrubber tank
 - b. Plexiglass accumulator
 - c. Flowmeter, Schutte and Koerting

III. Progress on Installation

Preliminary work has begun on the installation of equipment for Test Series No. 2. The vacuum pump was received from Ingersoll-Rand on 16 June and it has been bolted into place. The piping for the vacuum pump cannot be installed until the scrubber tank is received. The scrubber tank is necessary to keep water from entering the vacuum pump.

It was decided to have the plexiglas accumulator manufactured locally in order to get an earlier delivery date. The accumulator is promised in early August.

Sketches have been made in order to facilitate installation of the vacuum system once all the equipment is received.

Temperature sensing devices were removed from the system and recalibrated. Additional sensors have been ordered for the vacuum system.

The tachometer generator was removed from the shaft of D. C. pump motor and pump speeds are now measured with a Hasler hand tachometer and verified with a strobotac.

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