CIVIL ENGINEERING DEPARTMENT
FRITZ ENGINEERING LABORATORY
HYDRAULICS DIVISION
Memorandum No. M-27
F.L. Report No. 277-M-27

STATUS REPORT OF RESEARCH PROJECT
ON
IMPROVING DESIGN OF A HOPPER DREDGE PUMP

Prepared by
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Prepared for
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July 1961
Bethlehem, Pennsylvania
STATUS REPORT OF RESEARCH PROJECT
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I. INTRODUCTION

The following report summarizes the studies performed during the months of May and June 1961, at the Hydraulics Division of Fritz Engineering Laboratory, under terms of Contract No. DA-36-109-CIVENG-59-112. Earlier work was described in Status Reports dated: December 1958(1)*, February 1959(2), April 1959(3), June 1959(4), December 1959(6), February 1960(7), March 1960(9), April 1960(10), May 1960(11), June 1960(12), July 1960(13), August 1960(15), September 1960(16), October 1960(17), November 1960(18), December 1960(19), February 1961(20), March 1961(21), April 1961(22), May 1961(23), and a Project Report dated September 1959(5).

II. EXPERIMENTAL STUDIES

A. General Comments

The experimental tests were performed with two impellers: (a) Impeller No. TD-7 and (b) Impeller No. TD-8. It will be recalled that the Impeller No. TD-7 has a 22-1/2° exit angle and a 45° entrance angle, while Impeller No. TD-8 has a 35° exit angle and a 45° entrance angle. Both impellers have an involute vane shape.

* Numbers in parentheses indicate References
Data were obtained for the following pump speeds: 1150, 1300, 1440, 1550, 1650, 1750, and 1900 rpm. The complete data have now been processed for two concentrations: of about 1170 grams per liter, and 1240 grams per liter. No appreciable wear was observed on the impellers.

B. Characteristic Curves

Complete characteristic curves for the pump with Impellers No. TD-7 and TD-8 are being prepared. The curves, as well as other pertinent data, will be presented in the project report covering this phase of the study.

III. EXPERIMENTAL RESULTS

A summary of pump efficiency obtained with various impellers is presented in Table I. The summary covers all impellers tested: No. 1 (The ESSAYONS impeller), TD-5, TD-6, TD-7, and TD-8, for two silt-clay-water mixture concentrations of 1170 and 1240 grams per liter, and speed range of 1150 to 1900 rpm.

Impeller No. TD-6 seems to have the highest average efficiency for concentration of 1170 grams/liter, and its average efficiency value is about 8 points higher than the ESSAYONS impeller No. 1.

Impeller No. TD-7 has the highest efficiency values for concentration of 1240 grams/liter. Its efficiency is about 12 points higher than the ESSAYONS impeller No. 1.
IV. FUTURE STUDIES

A. General Comments

The contract has been received for Phase IV of the originally planned program, and work has commenced on the general analysis of the results obtained to date.

B. Additional Tests

The silt-clay-water mixture was removed from the sump tank during the first part of June 1961, and the tank - as well as all the piping - was washed to remove all silt and clay which was deposited in various parts of the tank and the piping.

The testing with water started on June 22, 1961, Impeller No. TD-8 being installed in the pump. Future tests with water will include Impellers TD-5, TD-6, and TD-7.
REFERENCES

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(2) Herbich, J. B. STATUS REPORT OF RESEARCH PROJECT ON IMPROVING DESIGN OF A HOPPER DREDGE PUMP. Fritz Engineering Laboratory Memorandum No. M-2 Lehigh University, February 1959

(3) Herbich, J. B. STATUS REPORT OF RESEARCH PROJECT ON IMPROVING DESIGN OF A HOPPER DREDGE PUMP. Fritz Engineering Laboratory Memorandum No. M-3 Lehigh University, April 1959

(4) Herbich, J. B. STATUS REPORT OF RESEARCH PROJECT ON IMPROVING DESIGN OF A HOPPER DREDGE PUMP. Fritz Engineering Laboratory Memorandum No. M-4 Lehigh University, June 1959

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(6) Herbich, J. B. STATUS REPORT OF RESEARCH PROJECT ON IMPROVING DESIGN OF A HOPPER DREDGE PUMP. Fritz Engineering Laboratory Memorandum No. M-5 Lehigh University, December 1959

(7) Herbich, J. B. Weiss, W. L. Waddington, W. STATUS REPORT OF RESEARCH PROJECT ON IMPROVING DESIGN OF A HOPPER DREDGE PUMP. Fritz Engineering Laboratory Memorandum No. M-6 Lehigh University, February 1960
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(8) Weiss, W.L. SUGGESTED DESIGN CHANGES FOR A CENTRIFUGAL PUMP IMPELLER HANDLING DREDGED MUD Fritz Engineering Laboratory Special Report Lehigh University, November 1959

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(10) Herbich, J.B. STATUS REPORT OF RESEARCH PROJECT ON IMPROVING DESIGN OF A HOPPER DREDGE PUMP. Fritz Engineering Laboratory Memorandum No. M-9 Lehigh University, April 1960

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(12) Herbich, J.B. Waddington, W.M. ANALYSIS OF HIGH-SPEED MOVIES OF A MODEL PUMP Fritz Engineering Laboratory Memorandum No. M-11 Lehigh University, June 1960

(13) Herbich, J.B. Long, J.L. STATUS REPORT OF RESEARCH PROJECT ON IMPROVING DESIGN OF A HOPPER DREDGE PUMP. Fritz Engineering Laboratory Memorandum No. M-13 Lehigh University, July 1960

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(16) Herbich, J.B. STATUS REPORT OF RESEARCH PROJECT ON IMPROVING DESIGN OF A HOPPER DREDGE PUMP. Fritz Engineering Laboratory Memorandum No. M-15 Lehigh University, September 1960

(17) Herbich, J.B. STATUS REPORT OF RESEARCH PROJECT ON IMPROVING DESIGN OF A HOPPER DREDGE PUMP. Fritz Engineering Laboratory Memorandum No. M-17 Lehigh University, October 1960

(18) Herbich, J.B. STATUS REPORT OF RESEARCH PROJECT ON IMPROVING DESIGN OF A HOPPER DREDGE PUMP. Fritz Engineering Laboratory Memorandum No. M-19 Lehigh University, November 1960

(19) Herbich, J.B. STATUS REPORT OF RESEARCH PROJECT ON IMPROVING DESIGN OF A HOPPER DREDGE PUMP. Fritz Engineering Laboratory Memorandum No. M-20 Lehigh University, December 1960

(20) Herbich, J.B. STATUS REPORT OF RESEARCH PROJECT ON IMPROVING DESIGN OF A HOPPER DREDGE PUMP. Fritz Engineering Laboratory Memorandum No. M-21 Lehigh University, February 1961

(21) Herbich, J.B. STATUS REPORT OF RESEARCH PROJECT ON IMPROVING DESIGN OF A HOPPER DREDGE PUMP. Fritz Engineering Laboratory Memorandum No. M-22 Lehigh University, March 1961
Reference

(22) Herbich, J.B.  STATUS REPORT OF RESEARCH PROJECT ON IMPROVING DESIGN OF A HOPPER DREDGE PUMP. Fritz Engineering Laboratory Memorandum No. M-24 Lehigh University, April 1961

(23) Herbich, J.B.  STATUS REPORT OF RESEARCH PROJECT ON IMPROVING DESIGN OF A HOPPER DREDGE PUMP. Fritz Engineering Laboratory Memorandum No. M-26 Lehigh University, May 1961
### Table I - Summary of Test Data

<table>
<thead>
<tr>
<th>Speed RPM</th>
<th>Flow GPM</th>
<th>Silty-Clay-Water Mixture Concentration</th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1170 grams/liter</td>
</tr>
<tr>
<td></td>
<td></td>
<td>No.1</td>
</tr>
<tr>
<td>1150</td>
<td>800</td>
<td>72.7</td>
</tr>
<tr>
<td></td>
<td>1000</td>
<td>71.6</td>
</tr>
<tr>
<td>1300</td>
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<td>1000</td>
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</tr>
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</tr>
<tr>
<td>1750</td>
<td>800</td>
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<tr>
<td>1900</td>
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</tr>
<tr>
<td></td>
<td>1000</td>
<td>--</td>
</tr>
<tr>
<td>All Speeds Avg.</td>
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<tr>
<td></td>
<td>1000</td>
<td>72.1</td>
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