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ADDITIONAL PUMPING CAPACITY, 181-D

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PERFORMANCE TEST
ADDITIONAL PUMPING CAPACITY, 181-D

by

J. W. Hedges, Supervisor
D-DR Maintenance Engineering
APPLIED REACTOR ENGINEERING

October 30, 1962

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PERFORMANCE TEST

ADDITIONAL PUMPING CAPACITY, 181-D

October 30, 1962

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October 30, 1962

PERFORMANCE TEST
ADDITIONAL PUMPING CAPACITY, 181-D

INTRODUCTION

The existing pumping capacity and piping intertie arrangement between 181-D and 183-DR makes it necessary to continuously cross-feed treated water from 183-D to the 183-DR flumes to insure adequate reactor flow to 105-DR to meet present production levels. This arrangement means that pumping equipment in both 181-D and 183-D is kept in use to the extent that repair or productive maintenance work must be accomplished during reactor outages, or production levels must be reduced to release a pumping unit during operation.

PURPOSE

The purpose of this performance test is to evaluate the effectiveness of an installed third impeller stage on one pump on 181-D unit No. 4. This can be accomplished with no increase in motor size or switchgear capacity. If this proves successful, conversion of the remaining four units would permit full use of the filter capacity of 183-DR; thereby, providing enough pump flexibility to release individual 181-D and 183-D pumping units for maintenance work during normal operation.

BASIS AND JUSTIFICATION

Under existing operating conditions, the process water from the river to the D and DR reactors is as shown on the schematic diagram attached to this document. To provide make-up from 183-D to 183-DR requires that backwash pumps No. 1, No. 2, and No. 3 be used 100 per cent of the time during the nine months of the year when turbidity is highest. A major failure of one of these backwash pumps would require approximately 36 hours of around-the-clock work to repair (based upon actual motor failure in April of 1960 on a 183-D process pump). With both reactors operating at present flow rates, storage tank levels at 190-DR would drop to an unsafe level in approximately four hours.

A loss of one unit at 181-D with no input water available from 100-B or 100-F via the export system but with No. 17 pump and the two steam-driven pumps at 181-D pumping to 182-D would result in a loss of at least 4,000 gpm to the reactors. Repair time on an emergency basis for major failures in these units is estimated to be five days if all materials are available. The proposed modification would provide an estimated 6,000 to 8,000 gpm additional pumping capacity through the 183-DR filter plant. Loss of one of the 181-D pumps now pumping to 183-DR could then be compensated for by the other four units, pump No. 17, and the 182-D to 183-DR make-up system. Loss of a 183-D make-up pump could largely be compensated for by full use of 181-D units No. 1 through No. 5.

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Thus, the basic justification for added 181-D pumping capacity is to provide enough system flexibility to help assure continuity of operation at existing power levels. In addition, this same flexibility should permit scheduling of productive maintenance work during the operating periods when more manpower is available on a straight-time basis.

The conversion of one pump at this time does not give this total system flexibility. However, it is desirable to proceed in this manner to:

1. Check the validity of the original pump vendor's recommendation that a third impeller stage is a better way to utilize the excess motor power than to install larger impellers.
2. Check vibration and operating characteristics of a unit installed in the actual river pumping system.
3. Make certain that, while the full power rating of the motor is used, it is not exceeded.

PROCEDURE

1. General

Preliminary testing has shown that pump No. 4 will require replacement of the existing impellers to restore it to its original operating characteristics. It is planned to obtain five different pressure and flow combinations on the modified pump No. 4 with all three impellers installed and compare these with pump No. 1 which had new impellers installed in August of 1961. Approximately three points on the characteristic curve will be obtained with all five pumps operating. The attached test data sheets and characteristic curves show the condition of the existing facilities as found on test runs made in October of 1962.

2. Instrumentation

- a. Install a Heise gauge capable of reading 0-100 psig on No. 1 and No. 4 pump discharges during each of their respective test runs.
- b. Attach steel tapes to wooden floats for each of the six 183-DR subsidence basins.
- c. Have IRD vibration analyzers available.

3. Test Operation

a. Operation of No. 4 pump only

- 1) Drain one subsidence basin at 183-DR down approximately 12 feet.

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- 2) Valve flow from 181-DR to the lowered 183-DR subsidence basin.
 - 3) Establish flow from No. 4 unit; set desired discharge pressure (see data sheet) by regulating with the 20 inch discharge gate valve.
 - 4) When flow and pressure are stabilized, notify 183-DR building. Simultaneously, take a basin level measurement and start timing run.
 - 5) During run, measure RPM, voltage, current, and vibration.
 - 6) After approximately 20 minutes, take a final basin level and record time of the run.
 - 7) Repeat steps 3) through 6) for the other four discharge pressure settings.
- b. Operation of No. 1 pump only
- Repeat steps 1) through 7) of a.
- c. Operation of pumps 1, 2, 3, 4, and 5
- 1) Drain all 183-DR subsidence basins down approximately eight feet.
 - 2) Return all valving at 183-DR and 181-D to normal.
 - 3) Establish flow from all five units. Set desired discharge pressure (see flow sheet) by regulating with the 20 inch discharge gate valves.
 - 4) When flow and pressure are stabilized, notify 183-DR building. Simultaneously, take basin level measurements and start timing run.
 - 5) During run, measure RPM, voltage, current, and vibration on unit No. 4.
 - 6) After approximately ten minutes, take a final basin level and record time of the run.
 - 7) Repeat steps 3) through 6) for the other two discharge pressure settings.

RESPONSIBILITY

1. D-DR Power Operation

- a. Scheduling of test to insure operation continuity

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- b. Assuring compliance with Process standards
- c. Operation of valves and pumping equipment
- 2. D-DR Maintenance Operation
Installation of test measuring devices
- 3. D-DR Maintenance Engineering
 - a. Record data during test run
 - b. Analyze data and publish a report of the results of this test

Supervisor
D-DR Maintenance Engineering

JW Hedges/crf
October 30, 1962

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TEST DATA, 181-D PUMP UNITS 1, 2, 3, 4, AND 5

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Attachment Sheet No. 1

READING----													
RPM													
Discharge Head - PSI--													
Discharge Head-Feet(Lift Above)													
Elevation Head Correction in													
Feet (Lift Below)													
Velocity Head in Feet													
EST/ACTUAL													
Total Dynamic Head (in feet)													
Setting Basin Level at Start of													
the Run (in inches)													
Setting Basin Level at End of													
Run 8,954 for 1 basin (inches)													
x Gallons/inch													
■ Total Flow Gallons (x 1000)													
÷ Time of Run - Minutes													
■ Gallons per Minute (x 1000)													
Voltage													
Ammeter Reading -													
Phase 1, No. 4													
Phase 2, No. 4													
Average - Phase 3, No. 4													
Amps Corrected, No. 4													
Brake Horsepower, No. 4													
Field Efficiency, No. 4													
Pump Vibration, No. 4 unit													
Motor Flange -													
North & South													
East & West													
Pipe Column													
Elbow													

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WATER FLOW DIAGRAM 181-D TO 183-D-DR

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