Alabama Power Company
600 North 18th Street
Post Office Box 2641
Birmingham, Alabama 35291
Telephone 205 323-5341

F. L. CLAYTON, JR.
Senior Vice President

Alabama Power
the southern electric system

May 27, 1980

Docket No. 50-348
No. 50-364

Director, Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Re.: Letter from Mr. A. Schwencer to
Mr. F. L. Clayton Dated April 8, 1980,
Concerning Auxiliary Feedwater

Gentlemen:

In response to the referenced letter, Alabama Power Company submits Enclosure 1 for the Farley Nuclear Plant.

In addition, Alabama Power Company wishes to clarify our response to Recommendation GS-6 which was included in our letter to Mr. D. G. Eisenhut dated November 20, 1979. The clarification is provided as Enclosure 2.

If there are any further questions, please advise.

Yours very truly,

F. L. Clayton, Jr.

RWS:de

Enclosures

cc: Mr. G. F. Trowbridge
Mr. R. A. Thomas

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Enclosure 1

Recommendation GS-5

The licensee should verify that appropriate periodic testing is performed to demonstrate that the air reservoirs meet the minimum requirements (2 hours). If the air reservoirs cannot be shown to meet the two-hour requirement, then emergency procedures should be established for manually initiating and controlling the system independent of any AC power source.

Response

The air reservoirs (on the steam admission valves to the TDAFWP) will be tested each refueling cycle to verify the design intent of the air reservoir system. If the air reservoirs cannot be shown to meet the two-hour requirement, then emergency procedures will be established for manually initiating and controlling the system independent of any AC power source.

Recommendation GS-6

The licensee should confirm that these administrative controls are or will be written into their procedures.

Response

Such administrative control provisions have been incorporated into the appropriate plant procedures or directives.

Additional Short-Term Recommendations

1. The following criteria should be used when implementing this recommendation:

Requirement A

The system should be redundant all the way from the level detectors to the indications and alarms inside the control room.

Response

The proposed design for both units consists of two separate and redundant condensate tank level transmitters, one Train A and one Train B.

Within the control room, two separate indicators are provided. Each transmitter has its own annunciator point. Two alarm windows are provided in one light box.

Requirement B

The power supplies should also be redundant.

Response

The power supplies for the above design will be separate and redundant and have battery backup.

Requirement C

For the long term (1/01/81) the entire water level indication and alarm systems should be designed for safety grade requirements including the use of Class 1E circuitry and power supplies.

Response

Each transmitter loop will consist of an instrument power supply, a transmitter and an alarm module. All of these components and associated wiring will be Class 1E. Each alarm module will provide a contact closure for annunciation on a separate annunciator window. The annunciator itself is not Class 1E, but it has redundant power supplies; the primary supply is Class 1E.

2. The licensee should commit to follow the provisions of the revised AFW pump endurance test and submit the following test information:

Requirement A

A brief description of the test method (including flow schematic diagram) and how the test was instrumented (i.e., where and how the bearing temperatures were measured).

Response

There were two alternate test modes possible for each pump, i.e., recirculation back to the condensate storage tank or feeding the steam generators (see Figures 1, 2 and 3). The recirculation path to the condensate storage tank from each pump includes a full flow test line as well as a smaller minimum flow line. Ingersoll-Rand recommends that the pumps not be operated for an extended period of time in any mode that would not allow at least 25% of rated flow. The minimum flow lines do not meet this criteria, therefore, the full flow test line was utilized in the 48-hour endurance test. For the purposes of these tests, Motor Driven AFW Pump 1A utilized the recirculation path to the condensate storage tank while tests for Motor Driven AFW Pump 1B and the turbine driven AFW Pump utilized flow to the steam generators.

RTD's are installed in the bearing oil reservoirs of both bearings for the motor and for the thrust bearing of the pump (see Figure 4). These bearing oil temperatures are indicated on a panel in the plant Control Room for both MDAFW pumps. Pump suction pressure, discharge pressure, and flow were all measured locally with installed gauges. There is no remote indication for the turbine bearing oil temperature, so only bearing housing temperatures could be measured. Pump room temperature and humidity were determined by using a sling psychrometer (see Figure 8).

Requirement B

A discussion of how the test conditions (pump flow, head, speed and steam temperatures) compare to design operating conditions.

Response

The pressure and flow for motor driven pumps 1A and 1B and the turbine driven pump are shown in Figures 7, 11 and 15 respectively. All readings are within the manufacturer's operating limits. The variation of pressure and flow with time on the TDAFW pump is attributable to drift of the flow control valve controllers, the turbine speed controller, or a combination of both. All pumps were operated at rated speed and since the tests on the turbine driven pump were conducted at 90% reactor power, steam temperatures were well above the 400°F. test requirement.

Requirement C

Plots of bearing/bearing oil temperature vs. time for each bearing of each AFW pump/driver demonstrating that temperature design limits were not exceeded.

Response

The limit established for bearing/bearing oil temperature was 185° F. For both motor driven pumps, the bearing/bearing oil temperatures remained well below the limit as depicted in Figures 6 and 10.

For the turbine driven pump, the bearing oil temperature increased steadily for the first two hours of operation, then leveled off between 181°F. – 183°F. for the remainder of the test. (See Figure 5 for TDAFW pump bearing/bearing oil temperature measurement and Figure 14 for a plot of all temperatures.)

Requirement D

A plot of pump room ambient temperature and humidity vs. time demonstrating that the pump room ambient conditions do not exceed environmental qualification limits for safety-related equipment in the room.

Response

Safety related valves with motor operators located in the pump room include the service water supply isolation valves and the discharge header isolation valves. The motor operators have a nameplate rating of 104° F. and can operate in 100% relative humidity. Safety grade pump room coolers will maintain the maximum room temperature below 104°F. Safety related instrumentation in the pump room was specified for operation at 120°F. and 100% relative humidity. Figures 8, 12, and 16 demonstrate that none of these values were exceeded for the two motor driven and the turbine driven pumps respectively.

Requirement E

A statement confirming that the pump vibration did not exceed allowable limits during the tests.

Response

Figures 9, 13 and 17 demonstrate that vibration in the motor driven and turbine driven pumps did not exceed allowable limits.

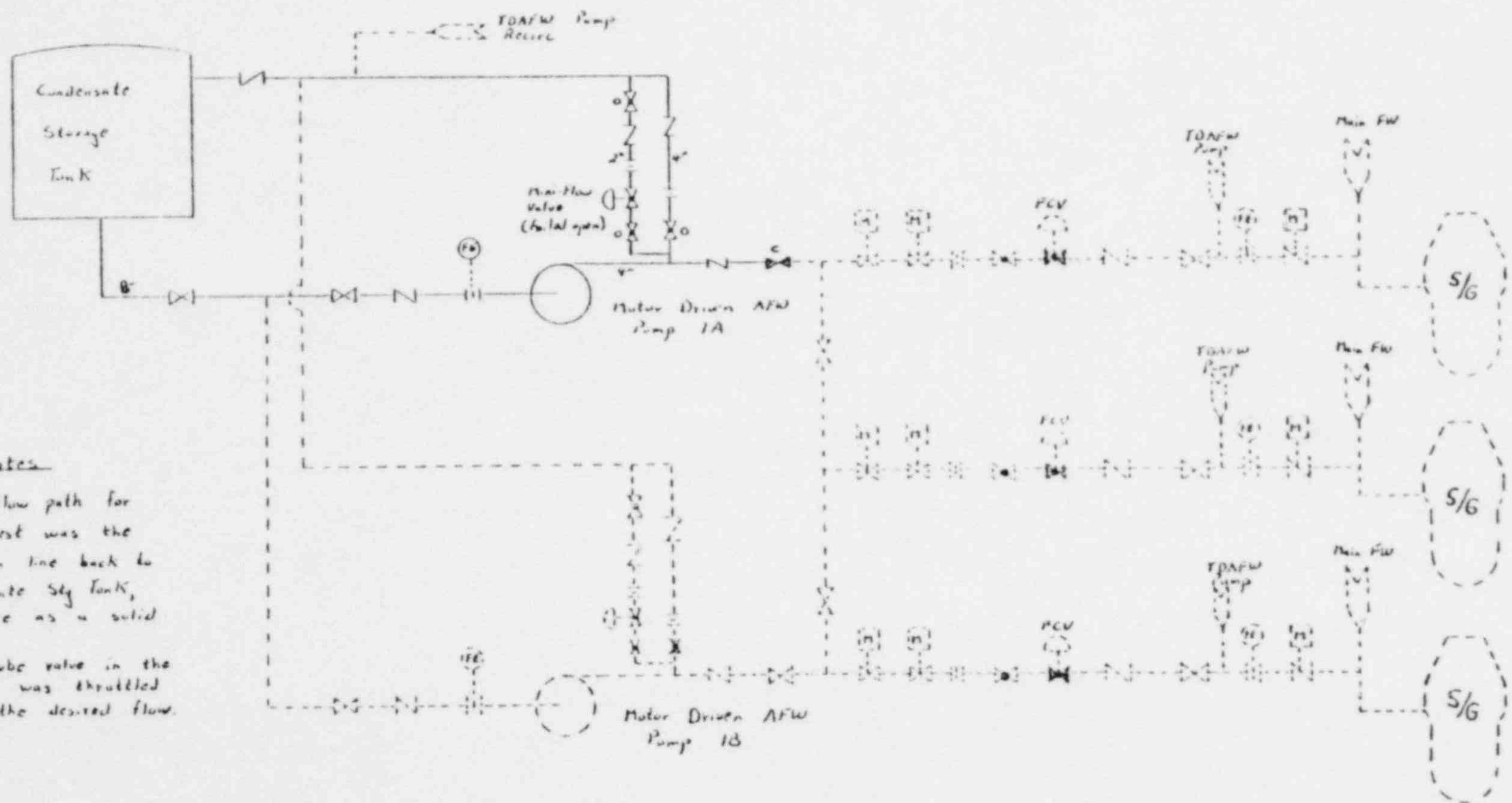
The above test data is applicable to Unit 1 only. The endurance tests have been completed for Unit 2 and will be transmitted when the data is assimilated.

Long Term Recommendations

1. Recommendation GL-3

See GS-5 above.

MOTOR DRIVEN PUMP 1A FLOW DIAGRAM

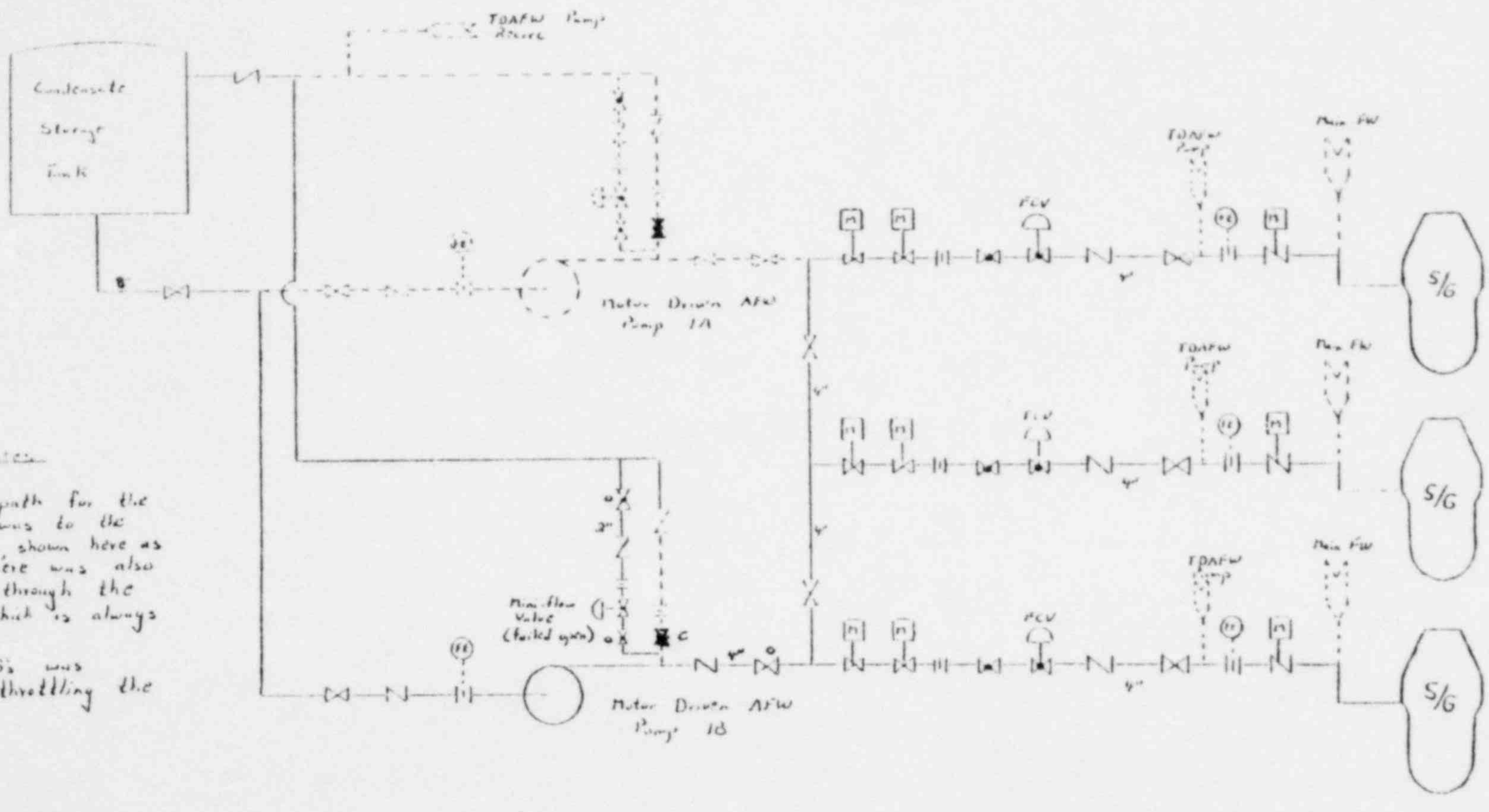


Notes

Pump 1A flow path for endurance test was the recirculation line back to the Condensate Stg Tank, shown here as a solid line.
The 4" globe valve in the recirc line was throttled to obtain the desired flow.

FIGURE 1

MOTOR DRIVEN PUMP 1B FLOW DIAGRAM

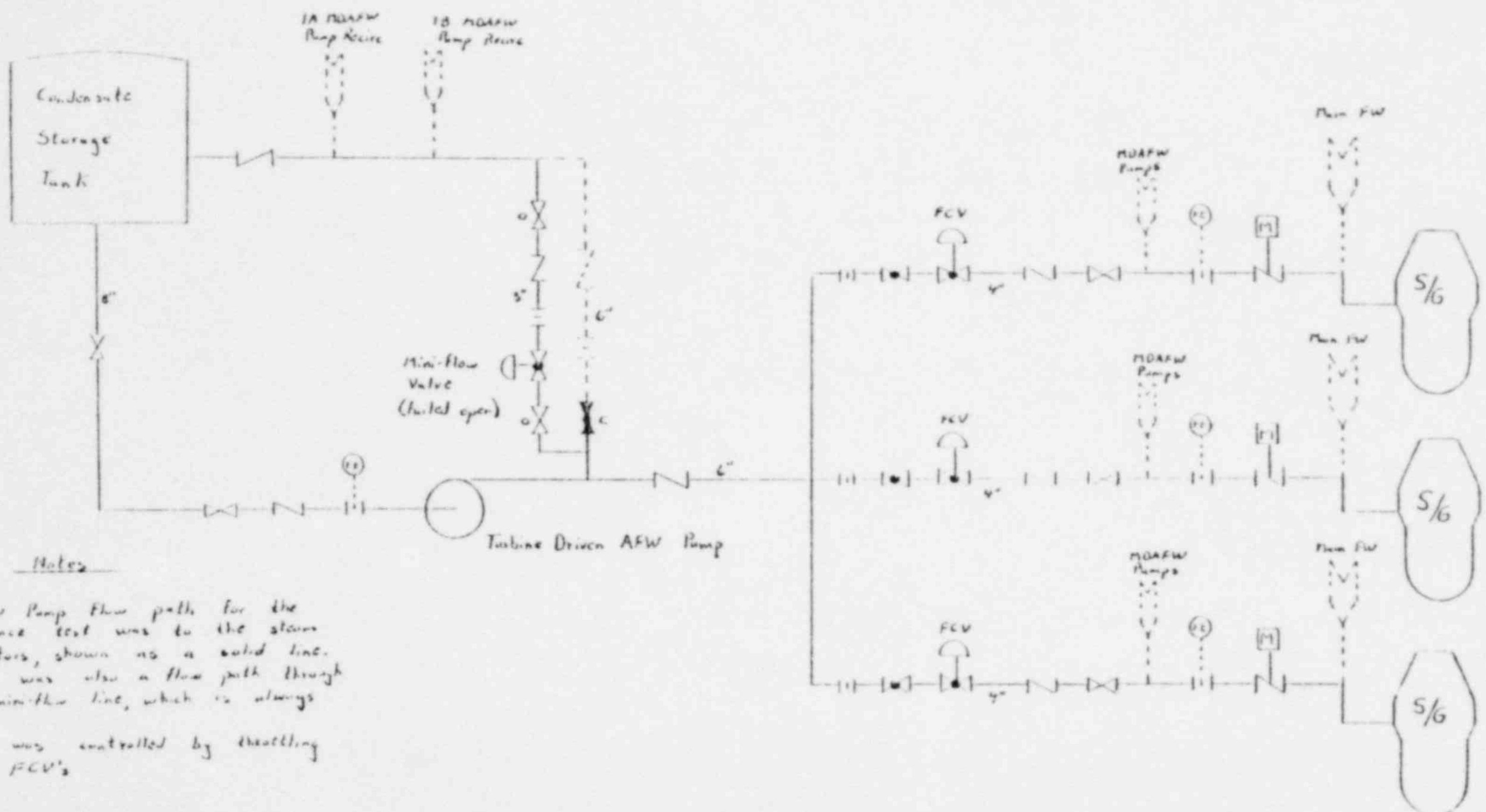


Notes

Pump 1B flow path for the endurance test was to the steam generators, shown here as a solid line. There was also a flow path through the mini-flow line, which is always open.
Flow to S/G's was controlled by throttling the FCV's.

FIGURE 2

TURBINE DRIVEN PUMP FLOW DIAGRAM

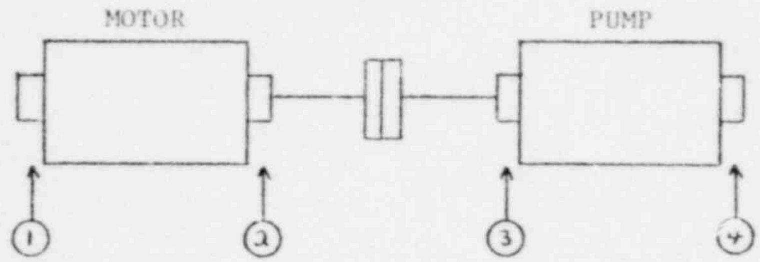


Notes

TDAFW Pump flow path for the endurance test was to the steam generators, shown as a solid line. There was also a flow path through the mini-flow line, which is always open.
Flow was controlled by throttling the FCV's

FIGURE 3

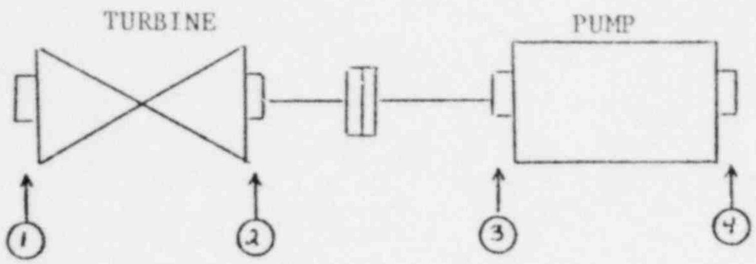
INSTRUMENTATION FOR MDAFW PUMP BEARING TEMP



	DESCRIPTION	BEARING/BEARING OIL TEMPERATURE MEASUREMENT
1	Motor Outboard Bearing	Digital thermometer for bearing housing and remote indication for bearing oil from RTD inserted in oil reservoir.
2	Motor Inboard Bearing	Digital thermometer for bearing housing and remote indication for bearing oil from RTD inserted in oil reservoir.
3	Pump Inboard Bearing	Digital thermometer for bearing housing.
4	Pump Outboard Bearing	Digital thermometer for bearing housing and remote indication for bearing oil from RTD inserted in oil reservoir.

FIGURE 4

INSTRUMENTATION FOR TDAFW PUMP BEARING TEMP



	DESCRIPTION	BEARING/BEARING OIL TEMPERATURE MEASUREMENT
1	Turbine Outboard Bearing	Digital thermometer for bearing housing.
2	Turbine Inboard Bearing	Digital thermometer for bearing housing.
3	Pump Inboard Bearing	Digital thermometer for bearing housing.
4	Pump Outboard Bearing	Digital thermometer for bearing housing and remote indication for bearing oil from RTD inserted in oil reservoir.

FIGURE 5

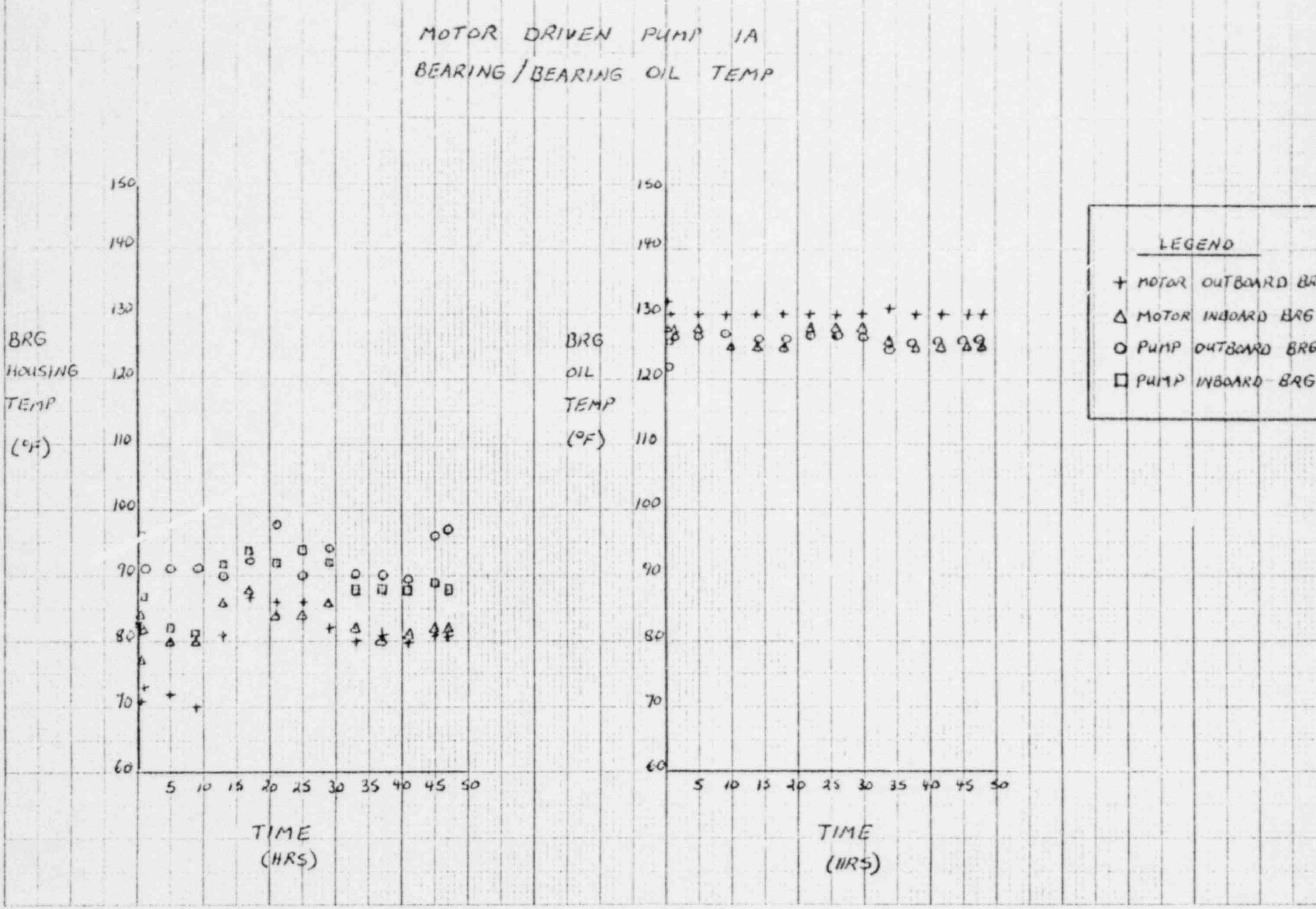

MOTOR DRIVEN PUMP 1A
BEARING / BEARING OIL TEMP
BRG HOUSING TEMP (°F)
150
140
130
120
110
100
90
80
70
60
5 10 15 20 25 30 35 40 45 50
TIME (HRS)
BRG OIL TEMP (°F)
150
140
130
120
110
100
90
80
70
60
5 10 15 20 25 30 35 40 45 50
TIME (HRS)
LEGEND
+ MOTOR OUTBOARD BRG
△ MOTOR INBOARD BRG
○ PUMP OUTBOARD BRG
□ PUMP INBOARD BRG

FIGURE 6

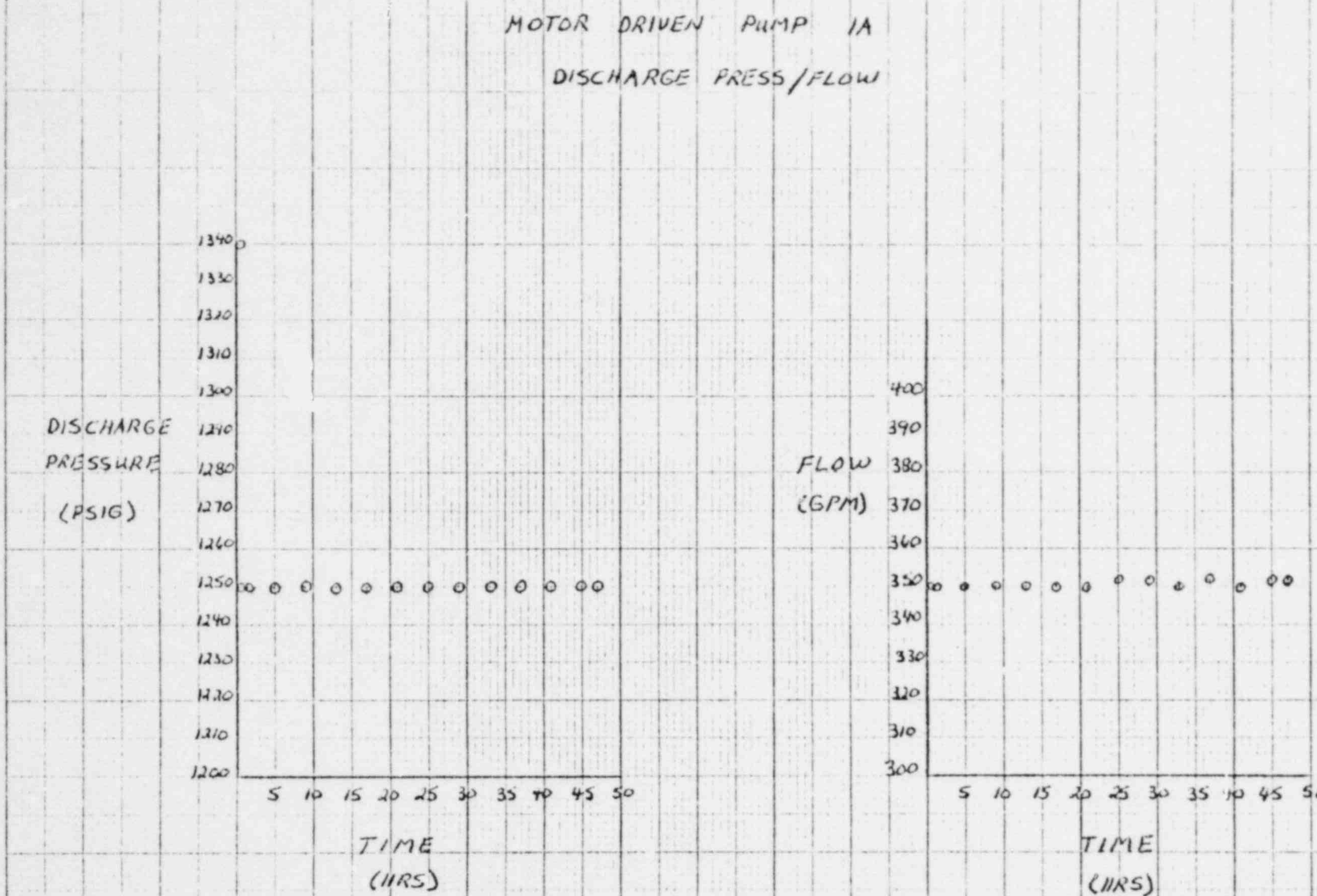

MOTOR DRIVEN PUMP 1A
DISCHARGE PRESS/FLOW
DISCHARGE PRESSURE (PSIG)
1340
1330
1320
1310
1300
1290
1280
1270
1260
1250
1240
1230
1220
1210
1200
5 10 15 20 25 30 35 40 45 50
TIME (HRS)
FLOW (GPM)
400
390
380
370
360
350
340
330
320
310
300
5 10 15 20 25 30 35 40 45 50
TIME (HRS)

FIGURE 7

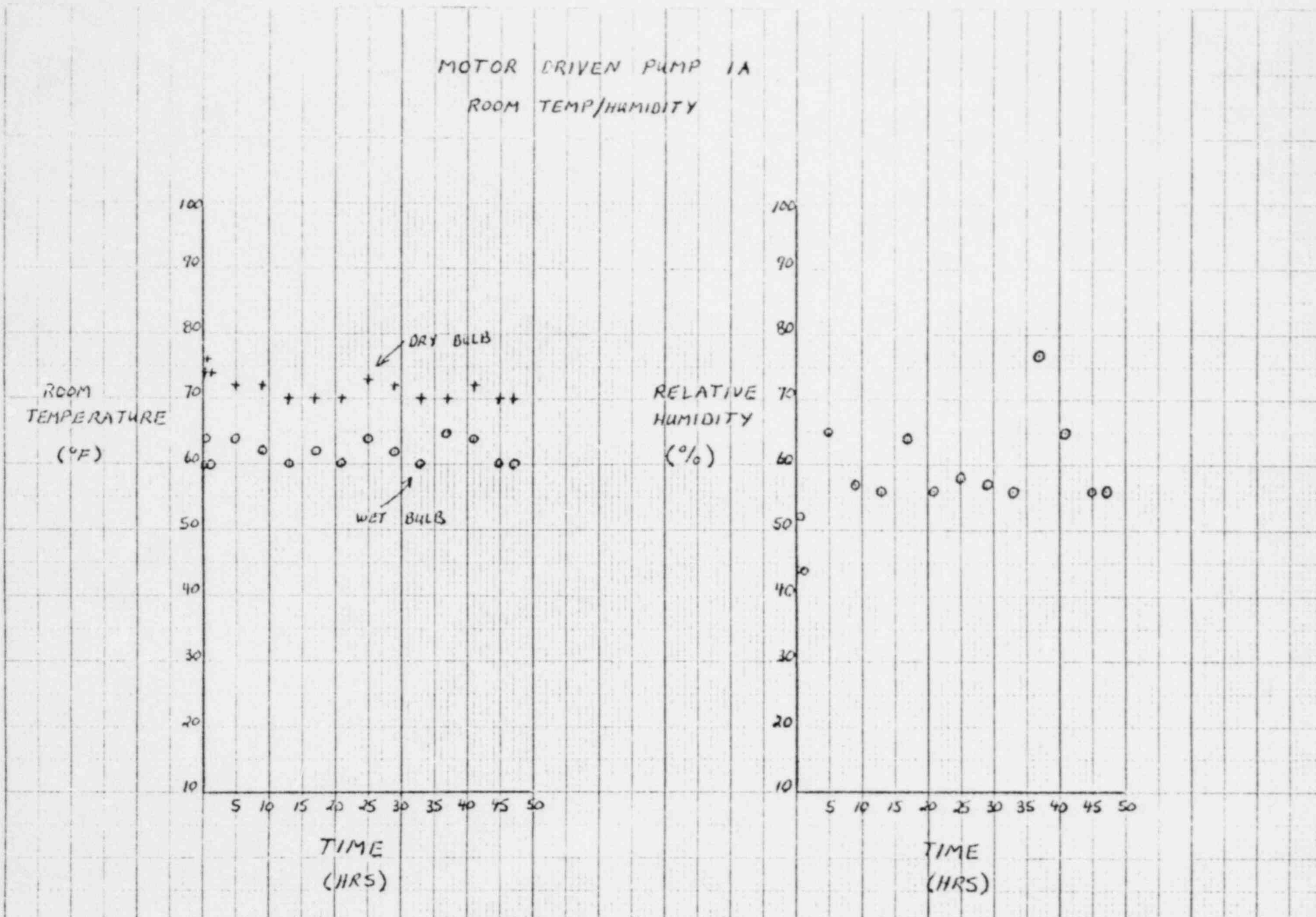
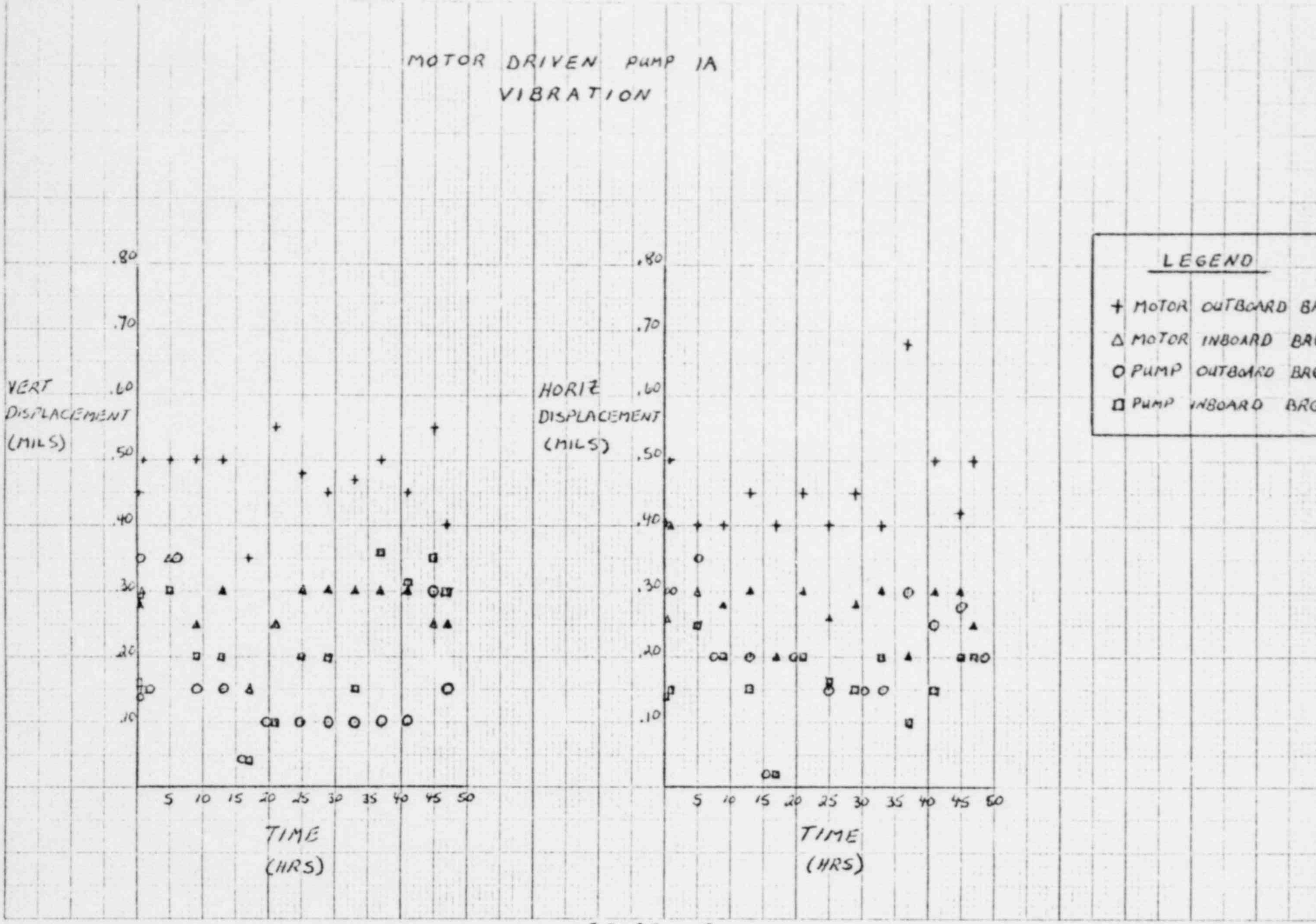

MOTOR DRIVEN PUMP 1A
ROOM TEMP/HUMIDITY
ROOM TEMPERATURE (°F)
100
90
80
70
60
50
40
30
20
10
DRY BULB
WET BULB
5 10 15 20 25 30 35 40 45 50
TIME (HRS)
RELATIVE HUMIDITY (%)
100
90
80
70
60
50
40
30
20
10
5 10 15 20 25 30 35 40 45 50
TIME (HRS)

FIGURE 8



MOTOR DRIVEN PUMP 1A
VIBRATION
VERT DISPLACEMENT (MILS)
.80
.70
.60
.50
.40
.30
.20
.10
5 10 15 20 25 30 35 40 45 50
TIME (HRS)
HORIZ DISPLACEMENT (MILS)
.80
.70
.60
.50
.40
.30
.20
.10
5 10 15 20 25 30 35 40 45 50
TIME (HRS)
LEGEND
+ MOTOR OUTBOARD BRG
Δ MOTOR INBOARD BRG
O PUMP OUTBOARD BRG
□ PUMP INBOARD BRG

FIGURE 9

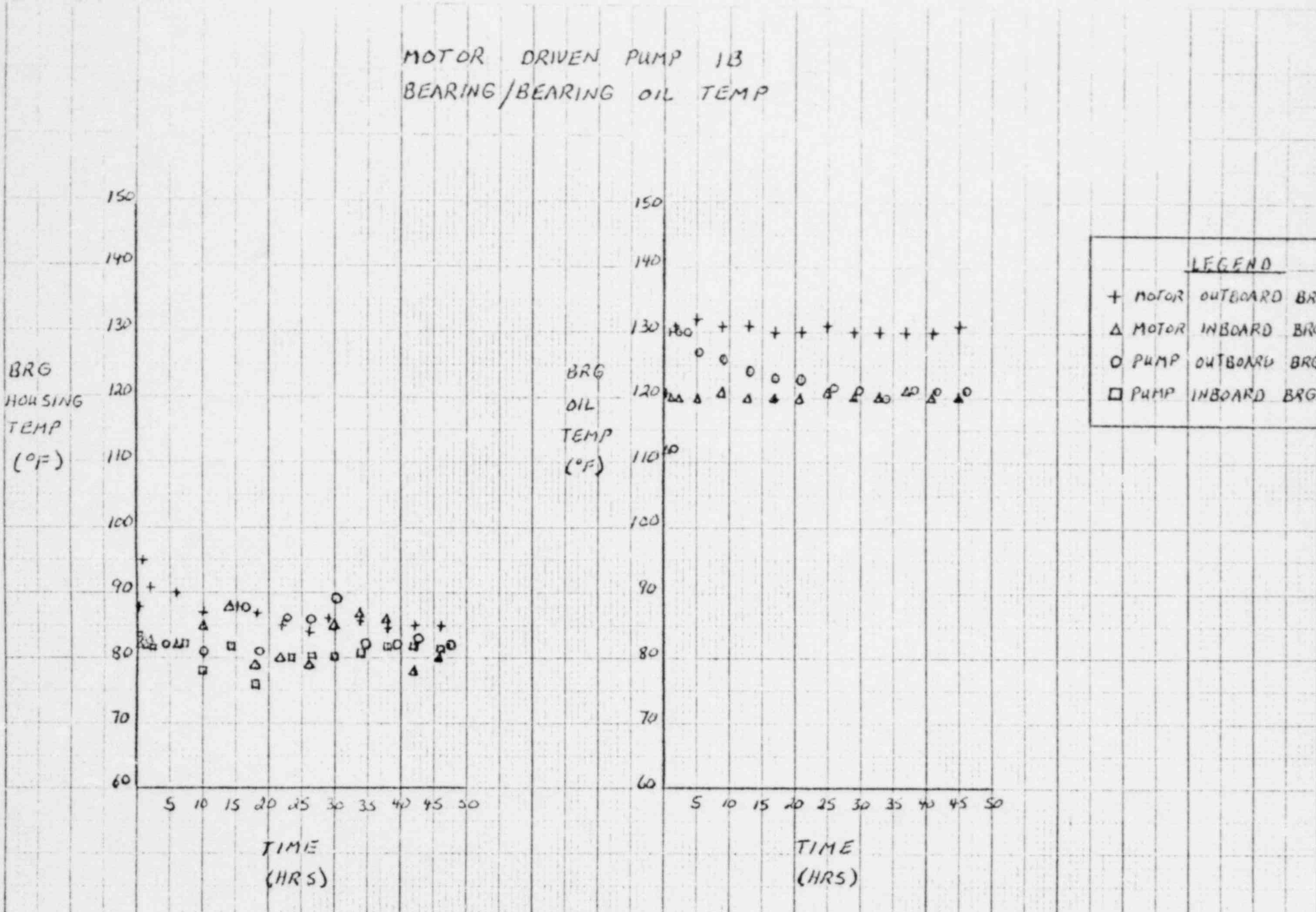

MOTOR DRIVEN PUMP 1B
BEARING/BEARING OIL TEMP
BRG HOUSING TEMP (°F)
BRG OIL TEMP (°F)
150
140
130
120
110
100
90
80
70
60
5 10 15 20 25 30 35 40 45 50
TIME (HRS)
LEGEND
+ MOTOR OUTBOARD BRG
Δ MOTOR INBOARD BRG
O PUMP OUTBOARD BRG
□ PUMP INBOARD BRG

FIGURE 10

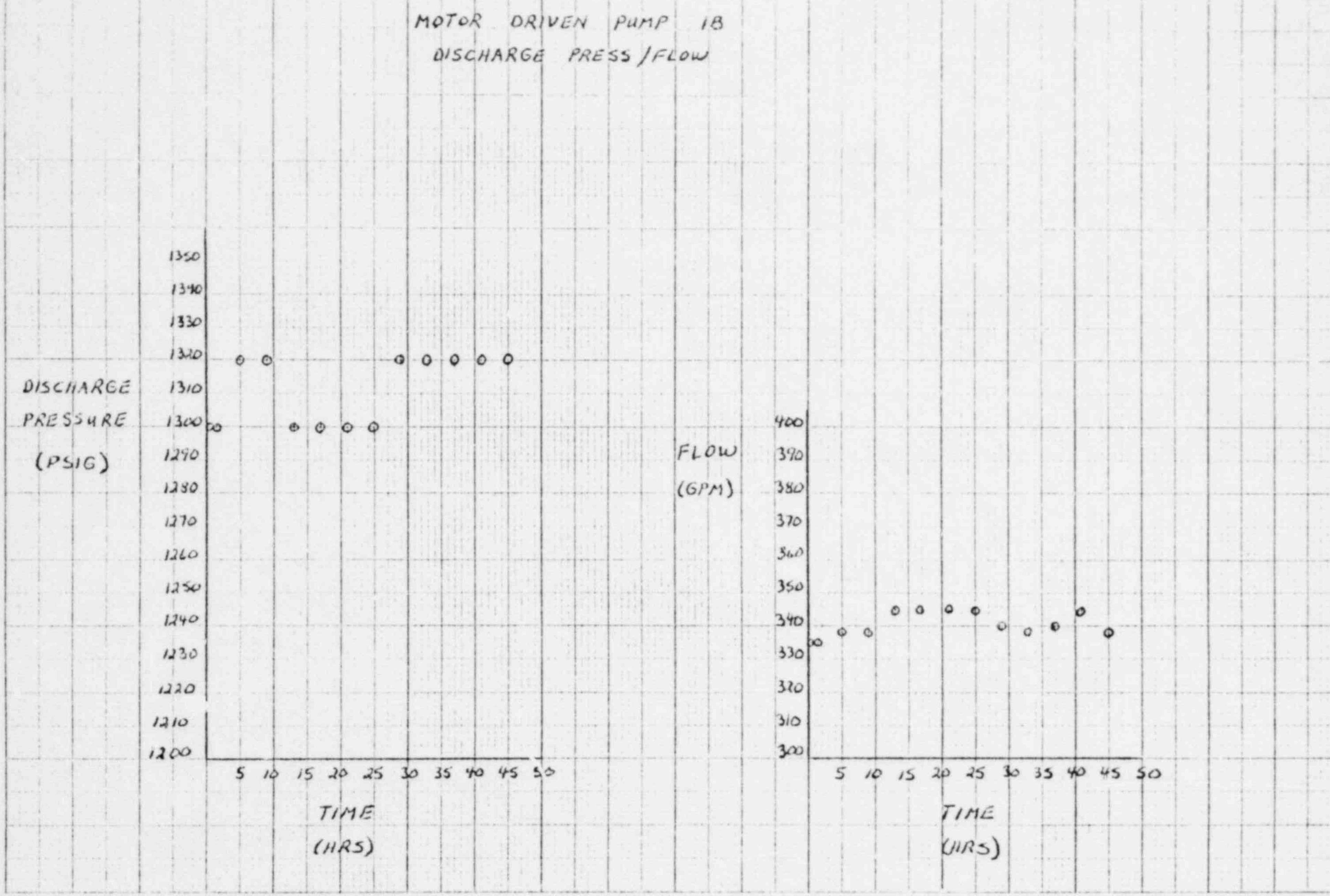

MOTOR DRIVEN PUMP 1B
DISCHARGE PRESS/FLOW
DISCHARGE PRESSURE (PSIG)
1350
1340
1330
1320
1310
1300
1290
1280
1270
1260
1250
1240
1230
1220
1210
1200
5 10 15 20 25 30 35 40 45 50
TIME (HRS)
FLOW (GPM)
400
390
380
370
360
350
340
330
320
310
300
5 10 15 20 25 30 35 40 45 50
TIME (HRS)

FIGURE 11

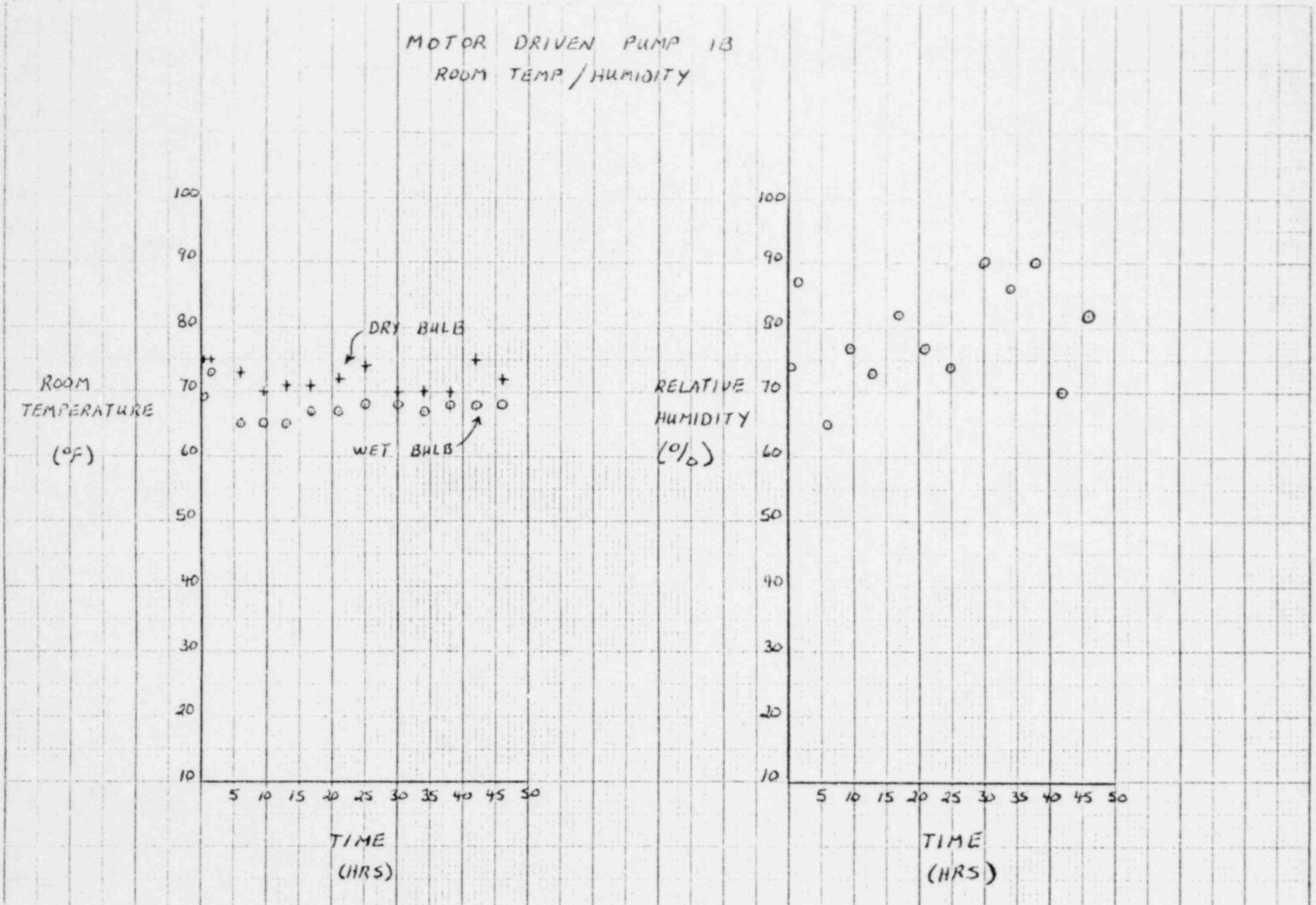

MOTOR DRIVEN PUMP 1B
ROOM TEMP / HUMIDITY
ROOM
TEMPERATURE
(°F)
100
90
80
70
60
50
40
30
20
10
DRY BULB
WET BULB
5 10 15 20 25 30 35 40 45 50
TIME
(HRS)
RELATIVE
HUMIDITY
(%)
100
90
80
70
60
50
40
30
20
10
5 10 15 20 25 30 35 40 45 50
TIME
(HRS)

FIGURE 12

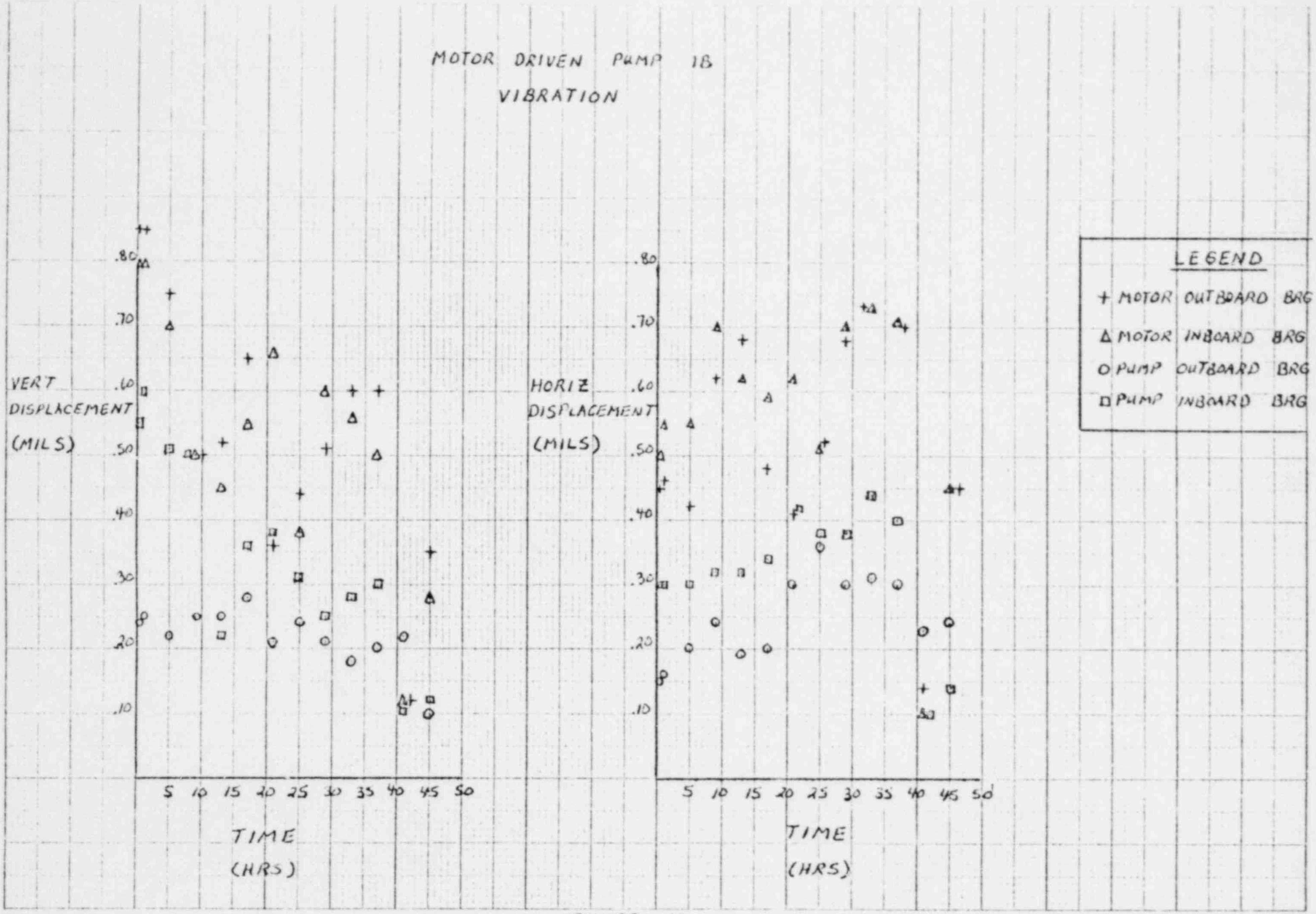
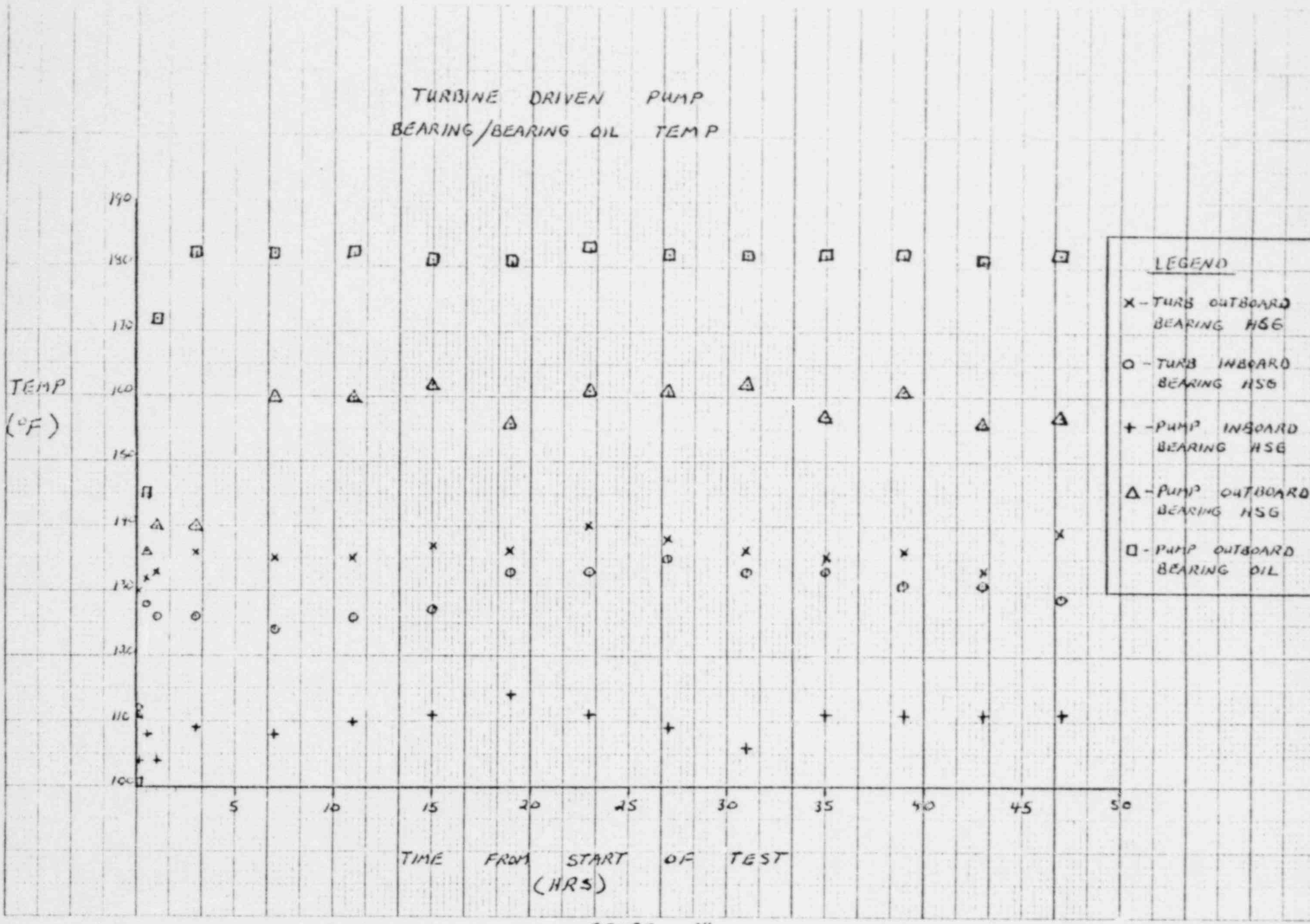

MOTOR DRIVEN PUMP 1B
VIBRATION
VERT DISPLACEMENT (MILS)
.80
.70
.60
.50
.40
.30
.20
.10
5 10 15 20 25 30 35 40 45 50
TIME (HRS)
HORIZ DISPLACEMENT (MILS)
.80
.70
.60
.50
.40
.30
.20
.10
5 10 15 20 25 30 35 40 45 50
TIME (HRS)
LEGEND
+ MOTOR OUTBOARD BRG
Δ MOTOR INBOARD BRG
O PUMP OUTBOARD BRG
□ PUMP INBOARD BRG

FIGURE 13



TURBINE DRIVEN PUMP
BEARING/BEARING OIL TEMP
TEMP (°F)
190
180
170
160
150
140
130
120
110
100
5
10
15
20
25
30
35
40
45
50
TIME FROM START OF TEST (HRS)
LEGEND
X - TURB OUTBOARD BEARING HSG
O - TURB INBOARD BEARING HSG
+ - PUMP INBOARD BEARING HSG
Δ - PUMP OUTBOARD BEARING HSG
□ - PUMP OUTBOARD BEARING OIL

FIGURE 14

TURBINE DRIVEN PUMP
DISCHARGE PRESS/FLOW

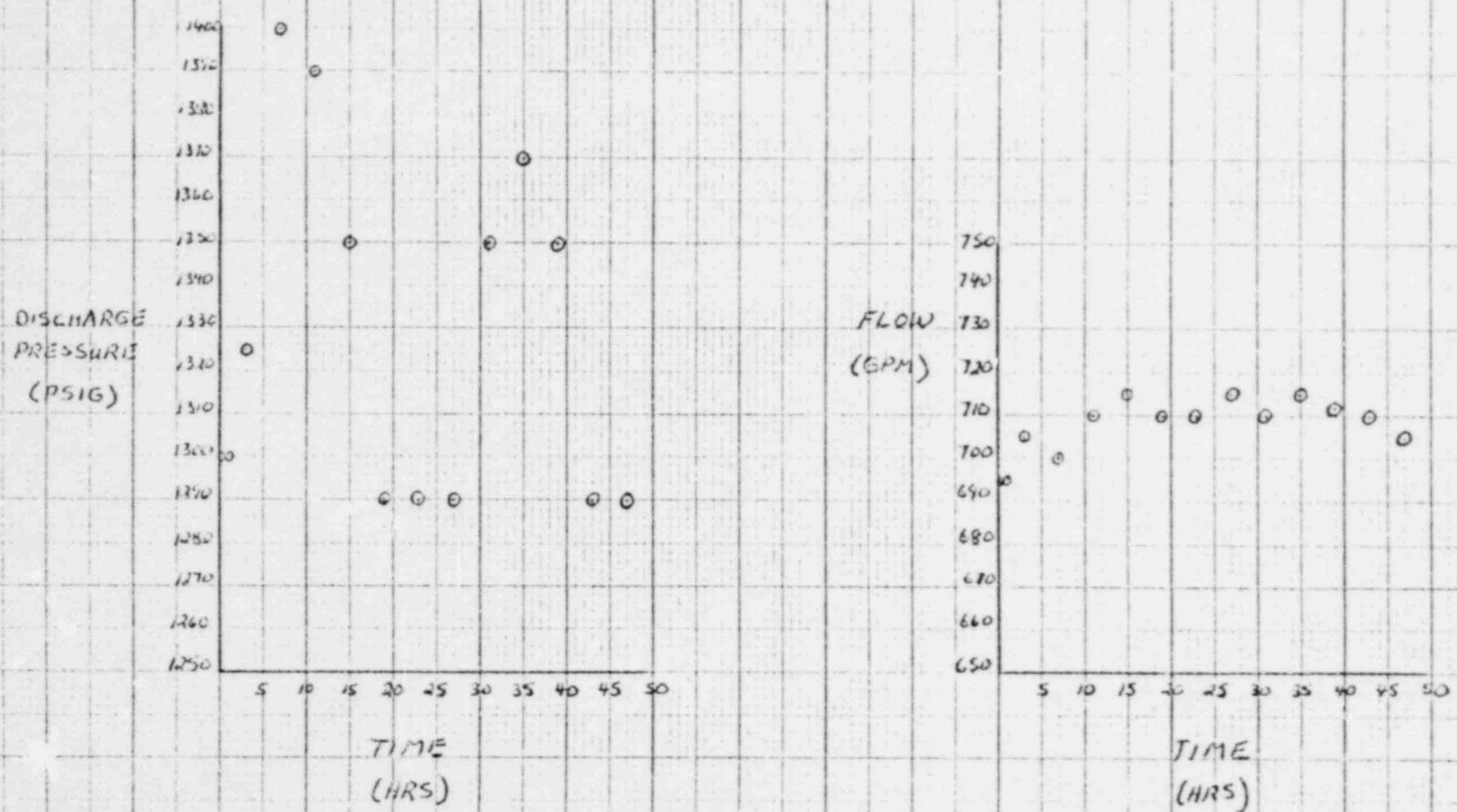


FIGURE 15

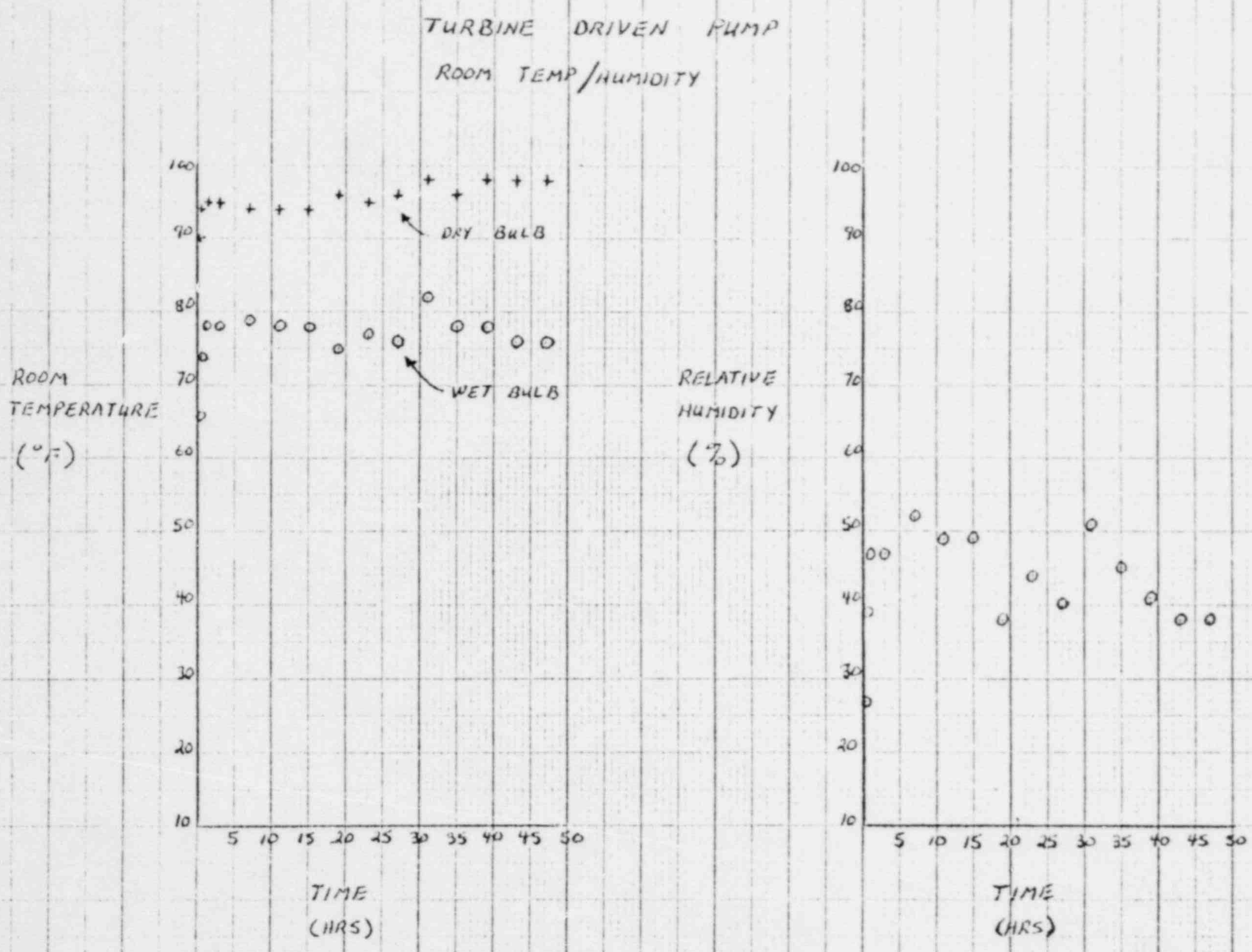

TURBINE DRIVEN PUMP
ROOM TEMP/HUMIDITY
ROOM TEMPERATURE (°F)
DRY BULB
WET BULB
TIME (HRS)
RELATIVE HUMIDITY (%)
TIME (HRS)

FIGURE 16

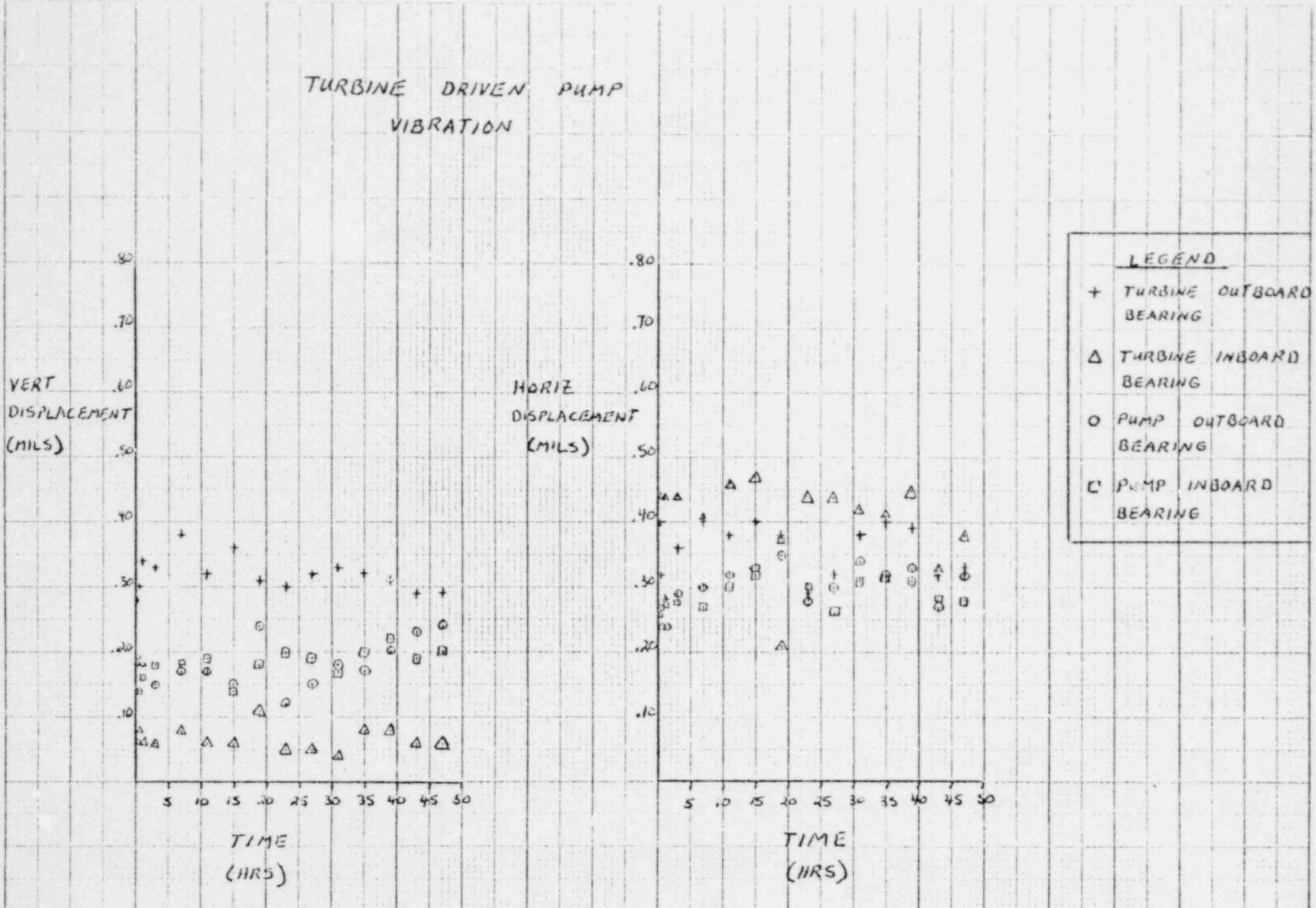

TURBINE DRIVEN PUMP
VIBRATION
VERT
DISPLACEMENT
(MILS)
.80
.70
.60
.50
.40
.30
.20
.10
5 10 15 20 25 30 35 40 45 50
TIME
(HRS)
HORIZ
DISPLACEMENT
(MILS)
.80
.70
.60
.50
.40
.30
.20
.10
5 10 15 20 25 30 35 40 45 50
TIME
(HRS)
LEGEND
+ TURBINE OUTBOARD BEARING
Δ TURBINE INBOARD BEARING
O PUMP OUTBOARD BEARING
□ PUMP INBOARD BEARING

FIGURE 17

Enclosure 2

The following is the revised response to Recommendation GS-6. (Revisions are noted by a vertical line in the right-hand margin.)

Administrative Controls have been implemented in the appropriate procedures which require that after maintenance is performed on the auxiliary feedwater system, which could affect proper valve alignment, or after a refueling outage, a system valve lineup will be performed by operations personnel. Independent verification of the system valve lineup will be performed by a second qualified individual.

In a letter dated October 13, 1979, the NRC requested that APCo propose Technical Specifications to assure that prior to plant startup following an extended cold shutdown, a flow test would be performed to verify the normal flow path from the primary AFW system water source to the steam generators.

In response to the above letter dated November 20, 1979, Alabama Power committed to implementing Administrative Controls and to propose Technical Specifications in compliance with this request. Upon further study, it was determined that Revision 1 of the Inservice Testing Program (transmitted 11/16/79) for Farley Nuclear Plant provides for exercising the valves in the turbine driven auxiliary feedwater pump discharge to the steam generators. This discharge rate is design flow of the auxiliary feedwater system during a mode of operation approaching cold shutdown or leaving cold shutdown in which steam is available. The Inservice Testing Program also provides for exercising the valves in the discharge from the motor driven auxiliary feedwater pumps to the steam generators at the design flow of the auxiliary feedwater system at cold shutdown. Verification of these flows will provide assurance that the valves have opened sufficiently to perform its function and that flow is going into the steam generators. The Inservice Testing Program is a part of Technical Specifications Section 4.0.5 that is presently in effect, therefore an additional Technical Specification is not required.