AUG 14 1997 Sta 37 22

ENGINEERING DATA TRANSMITTAL

Page 1 of 1

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1	1	Design Authority B.G. Berglin [signature] 01-04-97 N2-01	1	1	Cog Eng. Charles R. Nash [signature] 1/9/97 N2-05
		Design Agent	1	1	Project Engineer T.R. Benegas [signature] S2-24
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TEST REPORT FOR THE RUN-IN ACCEPTANCE TESTING OF THE HYDROGEN MITIGATION RETRIEVAL PUMP-3

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U.S. Department of Energy Contract DE-AC06-87RL10930

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Abstract: A report on the run-in acceptance testing of the Hydrogen Mitigation Retrieval Pump-3. The pump was received and tested at the 400 Area MASF Facility.

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TEST REPORT FOR RUN-IN ACCEPTANCE TESTING OF HYDROGEN MITIGATION RETRIEVAL PUMP-3

Prepared by Brian G. Berglin &
Charles R. Nash

B&W Hanford Company
Hanford Operations and Engineering Contractor

for the
U. S. Department of Energy
Richland Operations

TABLE OF CONTENTS

1.0 INTRODUCTION

This report will provide the findings of the demonstration test conducted on the Double-Shell Tank (DST) 241-SY-101 HMR Pump-3 in accordance with WHC-SD-WM-TP-434 "TEST PLAN FOR RUN-IN ACCEPTANCE TESTING OF HYDROGEN MITIGATION/RETRIEVAL PUMP-3" at the 400 Area Maintenance and Storage Facility (MASF) building from 7 June 1996 through 30 July 1996 per work package 4A-96-92/W.

The DST 241-SY-101 Hydrogen Mitigation Retrieval (HMR) Pump-3 is a 200-HP submersible electric driven pump that has been modified for use in the DST 241-SY-101 containing mixed waste located in the 200W area. The pump has a motor driven rotation mechanism that allows the pump column to rotate through 355°.

Prior to operation, pre-operational checks were performed which included loop calibration grooming and alignment (CG&A) of instruments, learning how plumb HMR-3 assembly hung in a vertical position and bump test of the motor to determine rotation direction.

The pump was tested in the MASF Large Diameter Cleaning Vessel (LDCV) with process water at controlled temperatures and levels. In addition, the water temperature of the cooling water to the motor oil heat exchanger was recorded during testing.

A 480-volt source powered a Variable Frequency Drive (VFD). The VFD powered the pump at various frequencies and voltages to control speed and power output of the pump. A second VFD powered the oil cooling pump. A third VFD was not available to operate the rotational drive motor during the 72 hour test, so it was demonstrated as operational before and after the test.

A Mini Acquisition and Control System (Mini Dacs) controls pump functions and monitoring of the pump parameters. The Mini-DACS consists of three computers, software and some Programmable Logic Controllers (PLC). Startup and shutdown of either the pump motor or the oil cooling pump can be accomplished by the Mini-DACS. When the pump was in operation, the Mini-DACS monitors automatically collects data electronically. However, some required data from ancillary systems was collected manually and recorded on log sheets. Automatic and manual data acquisition was collected as shown in Enclosure #1.

If a parameter exceeds pre-established limits, an alarm is sounded at the Mini-DACS console. If the parameter is in the abort range the pump is automatically shutdown by the system. Actual data points taken from the test although available are not provided in this report, since this would result in an unnecessary large volume of information. Mini-DACS recorded parameters every six seconds during the test. However, some graphs of the oil temperature and pressure verses time from the Mini-DACS data during the 72 hour test will be provided (Enclosure #7). The MASF facility instrumentation was recorded and manually logged throughout the duration of the test at specific intervals (Enclosure #2).

2.0 PRE-OPERATIONAL CHECKS

Prior to installing the pump in the LDCV, the pump was positioned horizontal on the floor of MASF to perform a bump test to learn direction of rotation and check instrument loops to verify accuracy and alarm/abort set points. Two items were completed before the installation of the pump began: 1) instrument loop checks to verify accuracy, alarm and abort set points and 2) the pump was "bump" tested to detect direction of rotation. Following these, the pump was transferred to the vertical position to perform pump alignment checks.

2.1 Instrumentation

The pump was received with the instrument wiring not terminated in Junction Box (JBX)-1. This was agreed upon between the TWRS Cognizant Engineer and the MASF Pump Project Manager prior to shipment of the pump to the 400 Area. Wiring for all instruments was prepped, labeled and landed per H-14-100380 Sheets 1 and 2. Each wire was terminated using crimped ferrules to help ease of removal and termination as required for testing. Each instrument was checked and calibrated as required per the loop calibration procedures in the work package. Results of the loop calibration records are included in Enclosure #3.

The Pump Volute Pressure, WST-PE-3123M, was within the 2 psig tolerance at the low end of the scale but off by nearly 3 psi at the upper range. The instrument is not adjustable and is physically sealed to prevent nitrogen leaks. As there are not alarms or aborts associated with this instrument the consensus from TWRS Engineering was to accept the conditions listed AS IS.

The Oil Pump Discharge Pressure, WST-PI-3104M and the Pump Casing Vibration (Accelerometer), WST-VE-3127P could not be calibrated within tolerance's specified in the test plan. The test plan deviations for these instruments are discussed in Section 4.

2.2 Bump Test

Electrical connections were made from the VFD to JBX-3 of the pump while the pump was on the floor of MASF. The bump test was done and the direction of rotation was recorded in the work package. The rotation was counterclockwise (as looking from the top of the bump) with the terminations as indicated. When the pump was connected to electrical power after the pump had been installed in the LDCV, the forward direction for the rotation on the VFD was reversed to make FORWARD the clockwise rotation of the pump.

2.3 Lifting the Pump to the Vertical Position

The pump was horizontally lifted up with the lower portion installed into the new "clamp and tilt fixture" as shown in Photo #1. The clamp and tilt fixture clamps to the bottom of the pump. The clamp is connected to a tilt fixture assembly vertically supported at the bottom four corners with roller skid dollies that will roll on the existing railroad tracks in the MASF high bay area. This allowed the pump to be lifted by the overhead crane from the horizontal position to the vertical position without horizontally moving the overhead crane as shown in Photo #2. The pump was designed to withstand the stresses induced from this lifting process therefore eliminating the need for a strongback and a mobile crane in addition to the MASF overhead crane. Following, the pump was removed from the clamp and tilt fixture as shown in Photo #3 in preparation for the pump alignment checks.

2.4 Pump Alignment Checks

2.4.1 Total Indicated Runout (TIR)

With the pump suspended freely in the vertical position from the overhead crane, the TIR and the side to side measurement of the pump shaft were recorded. TWRS Engineering established a limit of .003" TIR and side to side. The side to side measurement was .002". Using a calibrated dial indicator, the TIR measured .0045" exceeding the .003" limit. The TIR deviation was accepted by TWRS Engineering as explained in Section 4.

2.4.2 Plumbness of pump

Kaiser surveyors checked the plumb alignment of the pump in both the North/South and West/East directions from the Barrel Assembly Flange to the Flush Ring. The pump was 5/16" out of plumb in the east direction when measured in the North/South direction and 5/8" (.625") out of plumb when measured in the East/West direction as shown in Enclosure #4. The largest pump diameter of 40.9" is at the 13" tall pump barrier fluid reservoir at the lower portion of the pump. The DST riser for pump insertion into the tank is 41.5" translating to a .6" distance before reaching interference. As noted above, the 40.9" diameter of the pump is only for a short distance, therefore since the out of plumbness for the pump is .625" which is >.6". During insertion, the pump must be lowered into the riser slightly off center to eliminate any interference until the barrier fluid reservoir is past the bottom of the tank riser.

3.0 INSTALLATION

3.1 Insertion of Pump into the LDCV

Just before insertion, the pump barrier fluid reservoir was filled with approximately 5½ gallons of Chevron GST-32 turbine oil. The pump installation into the LDCV was completed using the approved Critical Lift Procedure "INSTALLING THE SY-101 MIXER PUMP-3 ASSEMBLY FROM THE LDCV IN THE MASF PUMP TEST FACILITY". The recorded weight of the pump 16,100 lbs. which includes the weight of the lifting yoke (1660 lbs.), load cell (≈50lbs) and a shackle (16lbs). Approximately 300 ft-lbs of torque was used to bolt the pump to the pump stand.

3.2 Mini-DACS Setup and Operation

The Mini-DACS was connected and configured by a Mini-DACS specialist contract worker. Most pump functions and monitoring of pump parameters are controlled by the Mini-DACS (See Enclosure #1). The Mini-DACS is currently programmed to prevent the mixer pump from rotating during operation. The Rotating Drive Motor could not be operated even if it was connected to the separate VFD. This deviation from the Statement of Work requirement to rotate the Mixer Pump during the Initial Ramp Up and the Seventy-Two Hour Full-Speed Continuous Run-In is explained in Section 4. The Separate VFD was connected to the Cooling Oil Pump Motor for operation during Initial Ramp Up and the Seventy-Two Hour Full-Speed Continuous Run-In test periods.

3.3 Rotating Mechanisms of the Pump

3.3.1 Rotation Drive Motor and Gear Box

The rotation motor and gear box were bolted into place. Following, the gear drive, rotational motor mounting plates, and the drive shaft were installed using a ⅜" shear pin. The rotation motor and gear box were connected to the 5 hp VFD and verified operational. Speeds of pump rotation were checked and adjusted in preparation for testing the limit switches.

3.3.2 Upper Column Split Ring and Limit Switch

The limit switch was tested in both the clockwise and counter clockwise direction and verified operational. During testing, it was found that the amount of drift that the pump rotates after the limit switch is tripped must be limited to keep the limit switches from being damaged. The VFD was adjusted to a low drift limit and tested satisfactorily. This limit of the VFD may be extracted from the Mini-DACS data. A 2" round tube stub protruding from the side of the pump, used for future tank waste transfers, nearly interfered with the upper column split ring during installation. The split ring triggers the limit switch which is mounted on the test stand about 3' lower than the expected field installation height. Therefore, field installation interferences are not expected.

3.3.3 Electrical Turntable/Power Trak Assembly

The electrical turntable/power trak assembly is a new feature for this third generation mixer pump. It allows the use of standard cabling for connecting electrical power and instruments between fixed and rotating junction boxes. Close observation of the turntable in operation revealed several binding points that prevented full 355° rotation as shown in Photos #4 & #5. A video was made of the sequence of events.

3.4 Nitrogen Supply

The nitrogen supply from compressed gas bottles was connected to the pump. But, due to the significant leaks in the mixer pump, it became necessary to substitute instrument air throughout the test. It was decided that the most efficient manner necessary to complete this test was to perform the operational test, then fix the leaks following the test. See Section 4 for explanation of this deviation from the test plan.

3.5 Motor Stator Reservoir

The motor stator reservoir was initially filled with 27 gallons of Shell Hyperia S220 oil as directed by the oil fill procedure, but oil was not observed in the storage tank site glass. An additional 6 gallons was added until the level was visible at mid level of the site glass.

3.6 Cooling Water to Heat Exchanger

Flexible hoses were installed from the MASF supplied cooling water to the oil/water heat exchanger with a 0-20 GPM flow meter on the inlet line and a 0-250°F temperature gauge on the outlet side. Long hoses were used so the pump could rotate while providing cooling water to the oil/water heat exchanger.

3.7 Jack Screws

The screw jacks were turned out to fit the brake shoes tight against the DST mock-up riser wall. This prevents pump lateral movement within the 42" riser during operation. The average torque value for screw jack deployment was 25 ft-lbs with the final torque averaging 27.5 ft-lbs after the brake shoes made contact with the mock-up riser wall.

3.8 LDCV Water Level

The water level in the LDCV was filled to 31'-6" over the cenerline of the horizontal discharge nozzle (36' level in the LDCV). The LDCV Water Level Control Panel was activated to alarm test personnel when the water level deviates ±1 foot from the 36' level. Enclosure #2 is a record of the LDCV water level throughout the 72 hour pump test.

4.0 TEST PLAN DEVIATIONS

The following deviations from the test plan requirements were accepted by the Pump Design Cognizant Engineer prior to testing the pump:

4.1 Nitrogen Supply

Requirement
Supply a dry nitrogen source to initially fill the pump system and pressurize up to 25 psig, then maintain between 21 and 25 psig during pump startup and operation with an expected leak rate $< .4\ ft^3$/hour.
Discussion
The leak rate was $> .4\ ft^3$/hour because of a known leak from the shroud air space through some electrical penetrations. This leak rate made it uneconomical to supply nitrogen from K bottles which were used up at the rate of one every 6 hours.
Deviation
Pressurized instrument air was used in lieu of nitrogen throughout the test.

4.2 Rotational Drive Motor and Gear Box

Requirement
1. Initial Ramp Up
   Following data recording at the first speed setting, the rotation motor will be started and operated to turn the mixer pump through one complete

rotational cycle (forward and backward approximately 170° of travel each direction). The rotational motor will require manual operation from the VFD (pending) while the mixer pump is in operation.

2. Seventy-two Hour Full-Speed Continuous Run-In
   During each shift, the rotational drive motor will be operated to advance the turntable through an angle of ±170°. As the 350° position is reached, the rotational drive will be reversed to continue the cycle. The 340° field of rotation is defined from orientations 10° to 350°.

Discussion
The Mini-DACS is currently programmed to prevent the Rotational Drive Motor from operating during Mixer Pump Operation. In addition, the Oil Cooling Motor Pump and the Rotational Gear Drive require separate power sources and only one separate source of power and VFD was available at MASF.
Deviation
1. Initial Ramp Up
   The Rotational Gear Drive was operated before the Initial Ramp Up testing period as authorized by TWRS Cognizant Engineer.
2. Seventy-two Hour Full-Speed Continuous Run-In
   The Rotational Drive Motor was operated before the 72 hour Full-Speed Continuous Run-In test period as authorized by the TWRS Cognizant Engineer.

4.3 TIR of Pump Alignment

Requirement
TIR and side to side limit of .003" with the pump hanging in the vertical position.
Discussion
Measurement of the TIR was .0045" exceeding the established limit by TWRS Engineering by .0015". Evaluations were discussed as to what damage could occur to the pump with a TIR exceeding the established limit.
Deviation
The TWRS Cognizant Engineer accepted the TIR of the pump shaft at .0045" and authorized us to proceed with testing of the Mixer Pump.

4.4 Oil Pump Discharge Pressure

The Oil Pump Discharge Pressure, WST-PE-3104M, was out of tolerance over the entire range. Attempts to adjust the zero and scale were unsuccessful. As this instrument did have an alarm, the software was adjusted to match the alarm point to the input.

4.5 Pump Casing Vibration

The Pump Casing Vibration (Accelerometer) WST-VE-3127P, was unresponsive to inputs. (Tapping on the pump with a hammer, no calibration points) It was noted throughout the test the readings from this element remained the same (0.1 g/s). After the pump had been removed from the LDCV the loop was checked again. The loop was responsive, but the element was dead. Ohmmeter readings on the element were 1.7 megohms.

5.0 TESTING

5.1 Initial Ramp Up

Initial Ramp up of the pump commenced on 07-08-96 at 600 RPM's with an LDCV tank temperature of 78.9 degrees. Ramp up consisted of raising the speed of the pump up 200 RPM's approximately every 15 minutes to ensure that all mechanical and electrical/I&C systems were operating correctly. The initial ramp up performed as expected with a duration of 46 minutes to reach 1200 RPM's. The Rotational Drive Motor operational test requirement was not performed during ramp up as described in Section 4.

5.2 72 Hour Test

Approximately seven hours into the 72 hour run the pump shutdown on an ABORT signal from the moisture alarm WST-ME-3113M. The alarm immediately cleared itself. The pump was restarted and twice more aborted on moisture within a two hour period. The test was secured for approximately two hours for evaluation by Engineering. Restarting of the pump with oil cooling in continuous operation appeared to alleviate the problem. During the remaining 72 hours of testing, several additional aborts were received because of the moisture element. Parameters of the oil cooling system were changed, but little success was recognized. The frequency of the alarms was random and could not be related to any specific condition of pump operation. During the last sixteen hours of the test, TWRS engineering authorized us to override the moisture alarm and allow continuous operation of the pump. This decision was based upon an oil sample taken during the test showing a moisture content of approximately 3% (Enclosure #5). Recommend software changes be made to eliminate spurious alarms. No further action was taken during the test. The Rotational Drive Motor operational test requirement was not performed during the 72 hour Test as described in Section 4.

5.2.1 Oil Cooling System Operation (Enclosure #6)

The pump oil heat exchanger/cooling system was tested under Engineering direction. Various water and oil flows were tested to determine the maximum and minimum heat removal capabilities and pressure differentials of the system. After testing was complete, the system was allowed to run at varying predetermined cooling water flows.

5.2.2 Initial Results and Findings

The mixer pump was allowed to operate without oil circulation until the temperature of the LDCV water rose above 100°F. The cooling water was established through the oil/water heat exchanger at 11 GPM. Following, the oil pump was started by the VFD at 200 RPM and accelerated in 200-300 RPM increments up to 1800 RPM every 3-5 minutes. In addition, the Motor Oil Pressure (PN2P0507) and Motor Oil Pressure Stator Bottom (MOPSTAB) were recorded during ramp up. The MOPSTAB is located at the bottom of the pump case downstream of the annular gap between the rotor and stator while the PN2P0507 is located near the oil vent valve above the heat exchanger on the discharge of the oil pump. (See Enclosure #6.) The static pressure drop between PN2P0507 and MOPSTAB is 14 psig. With the oil pump motor operating at 1800 RPM, the ΔP between PN2P0507 and MOPSTAB was 1.22 psig which correlates directly to the pressure drop across the gap between the rotor and stator. This pressure drop was considered negligible and produced results significantly better than expected.

5.2.3 Cooling Water Results and Findings

Throughout the test the cooling water flow was varied from 11 GPM down to 5 GPM with the LDCV water temperature at approximately 120°F. At 5 GPM, the ΔT of the cooling rose to 13°F, whereas it remained at a constant 10°F ΔT between 8 and 11 GPM. Near the end of the test, the cooling water was shut off with just the oil pump operating. Since water was used for the test medium in the LDCV, the actual viscosity of the waste medium in the SY-101 tank is a lot higher, therefore the pump did not obtain a full load test during the testing period simulating actual field conditions. This resulted in a low ΔT across the oil/cooling water heat exchanger on the cooling water side.

5.2.4 Current Draw on the Pump Motor

Concerns were raised during the test regarding the current draw on the motor. Even though the values were within the range considered normal for this size pump, the values seen during this test were at least 10% higher than when the pump was tested at Hazleton. Further evaluation by TWRS engineering and the MASF Test engineer revealed several factors that could affect the current readings: use of the VFD, variances on the VFD current readings, longer cable leads to the motor making the pump a bigger load, and differences in the load itself. No further action was deemed necessary.

5.2.5 Summary

The testing of 101-SY Backup Pump was considered successful with the below noted discrepancies and actions taken. Oil analysis reports are provided as shown in Enclosure #6. Actual data points taken from the test although available are not provided in this report, as this would have resulted in a large physical volume of information. (Mini-DACS recorded sensor inputs every six seconds when actual testing was ongoing.) Select graphs were generated from the Mini-DACS data on oil temperatures and pressures verses time (72 hour test) and are provided per Enclosure #7. In addition, some graphs showing pump speed and amps verses time are also included. The graphs in Enclosure #7 are configured from data averaged over 1 minute intervals from the Mini-DACS.

6.0 POST TESTING

6.1 Shear Pin Testing

The shear pin test on the pump rotational system was performed by torquing it until it sheared at 540 ft-lbs.

6.2 Oil System Pressure Test

The oil system was pressure tested with N_2 at 20 psi with the heat exchanger removed (Photo #6). The allowable leak rate acceptable by TWRS Cognizant Engineer is <.5 psi/hour. After 72 hours, the pressure dropped to 15 psi which results in a .06944 psi/hr leak rate. The heat exchanger was then installed and another decay pressure test was performed at 20 psi for 1 hour 17 minute. Pressure maintained 20 psi throughout the test. Therefore, the pressure leak test on the oil system was successfully passed with the system remaining in tact.

7.0 CORRECTIVE ACTIONS

7.1 Moisture Alarm

Additional bench testing of the moisture alarm circuit failed to reveal a functional problem with the circuit. Several oil samples with various concentrations of water were tested with alarms occurring as expected. The circuit did not appear extremely sensitive as theorized. To correct the problem, a separate set of moisture elements were installed upstream of the oil cooling pump and are in direct contact with the motor oil flowing through the system.

7.2 Electrical Turntable/Power Trak

There are several causes for the mechanical binding of the Power Trak. Larger sliding feet to bridge the stationary and rotational components of the system are necessary and a mechanical means to prevent the Power Trak from doubling on itself is needed. The small adjustments needed to make the power trak operate successfully will be accomplished per 4A-96-273/W.

7.3 Instrument Repairs

The oil pump discharge pressure element (WST-ME-3113M) must be replaced. The pump volute pressure element (WST-PE-3123P) and the accelerometer (WST-VE-3127P) also need replacing. However, engineering should perform an evaluation to determine the need and accuracy of the pump volute pressure element and accelerometer.

7.4 Leaks in the Pump Column and Motor Shroud

After the testing had been completed, the pump was removed from the LDCV and stationed in MASF to allow work on the leaks. During the repair portion of this testing, it was discovered that the column leaked very little into the motor shroud. A pressure test showed that leakage was less than the spec and so the column leaks were considered satisfactory.

Work on the motor shroud began immediately after the pump was removed from the LDCV and positioned back to the horizontal position. Several attempts to fill the leaks with caulking material (glyptol) were unsuccessful. Leaks were occurring in the conduit and possibly through the power and instrumentation cables. To resolve the problem a junction box was installed in both the power and instrumentation circuits. All of the circuits were rewired through terminal boxes to provide a break in the routes assumed to be leaking. The terminal boxes were then filled with potting material to provide an additional barrier against leaks as shown in

Photo #7. Following, the electrical terminal box assembly lid was installed and the instrument wiring connected as shown in Photo #8.

The pump column was pressure tested and verified to be leak tight.
The motor shroud was leak tested a variety of ways. First, it was pressurized to 28 psi with N_2. The allowable leakage as directed by TWRS Cognizant Engineer is <.7psi/hour. The pressure in the motor shroud decreased to 25 psi within 1 hour, 5 minutes resulting in a leakage 2.8 psi/hour. The pressure was bleeding over into the oil system. Therefore, the second test was done with the oil system at 20 psi and the motor shroud at 28 psi. During a 12-hour test, the shroud pressure dropped to 20.6 psi resulting in an .616 psi/hour pressure drop while the pressure on the oil system increased proportionally.

In conclusion, the oil system and the pump column that are on both sides of the shroud have successfully passed independent pressure tests. The motor shroud leaks into the oil system but the oil system does not leak into the motor shroud. Since the motor shroud is between the oil system and the pump column, no leakage will be loss to the atmosphere. Therefore, with concurrence from TWRS Cognizant Engineer, the motor shroud leakage to the oil system was acceptable since the independent pressure test of the oil system and pump column do not leak.

7.5 Instrument Tubing on Lower End of Pump

The instrument tubing needs securing on the lower end of pump. Some stainless steel hose clamps were installed around the instrument tubing cluster for the test with no apparent damage evident during the 72-hour test. However, prior to use in DST 241-SY-101, it is strongly recommended that additional permanent tubing supports be installed to secure the tubing from possible damage and probable loss of pertinent data.

7.6 Carbon Steel Parts below the Mounting Plate

All the Carbon steel below the mounting plate rusted from the 120°F temperature of the LDCV water condensing. If the pump was operated for a very long period in DST 241-SY-101 tank with the screw jacks out against the inside of the riser, it is possible that they could rust into place and be very difficult if not impossible to retract the screw jacks for removal.

7.7 New Valve added on Oil System to Assist in Draining Motor Oil

While draining oil from the motor, it became necessary to remove the heat exchanger so the system could be pressurized to remove the oil. An isolation valve was installed between the oil pump and the heat exchanger so the oil can be changed without removing the heat exchanger as shown on the Oil System Diagram on page 1 of Enclosure #6.

8.0 STORAGE

The pump was loaded onto a trailer provided by TWRS per 4A-96-288/W on 12-04-96. Transfer of the pump to the 200 Area for permanent storage occurred on 12-05-96.

9.0 REFERENCES

9.1 Work Packages

9.1.1 4A-96-092/W - Test 101SY Hydrogen Mitigation Pump #3 in LDCV
9.1.2 4A-96-273/W - Complete 101SY HMR Pump 3 Cable Track Assembly
9.1.3 4A-96-288/W - J3, Load SY-101 #3 Onto Truck For Ship To Stor

9.2 Engineering Change Notices

9.2.1 ECN 631714 - Prevented nitrogen leaks from the shroud air space
9.2.2 ECN 629121 - Wire the moisture sensor added to the oil cooling system
9.2.3 ECN 629119 - Preventing nitrogen leaks from the shroud air space
9.2.4 ECN 628794 - Replace disabled moisture sensor and change wiring diagrams
9.2.5 ECN 628793 - Motor oil change-out changes and provides moisture sensitive capability
9.2.6 ECN 628792 - Changes to WHC-SD-WM-TP-434 to allow usage of dry air instead of nitrogen.

10.0 ENCLOSURES

#1 Automatic (Mini-DACS) and Manual (MASF Facility) Data Acquisition (1 page)

#2 Manual Pump Test Logs (4 pages)

#3 Loop Calibration Records (2 pages)

#4 Vertical Plumbness (1 page)

#5 Motor Oil Analysis Report (6 pages)

#6 Oil System Diagrams (2 pages)

#7 Various (Oil Pressure/Oil Temperature/Motor Voltage/Motor Current/Pump Speed) verses Time (72 hour test) Graphs from Mini-DACS Data (8 pages)

11.0 PHOTOS

#1 BOTTOM OF PUMP SITTING IN THE CLAMP & TILT FIXTURE HORIZONTALLY

#2 TRANSFERRING PUMP FROM THE HORIZONTAL TO THE VERTICAL POSITION

#3 VERTICAL PUMP REMOVAL FROM THE CLAMP & TILT FIXTURE

#4 ENTIRE ELECTRICAL TURNTABLE/POWER TRAK BINDING

#5 CLOSEUP OF ELECTRICAL TURNTABLE/POWER TRAK BINDING

#6 20 PSIG NITROGEN LEAK TEST ON THE OIL SYSTEM

#7 POTTED NEW TERMINAL BOX ASSEMBLY

#8 NEW ELECTRICAL AND INSTRUMENT WIRING TERMINAL BOX ASSEMBLY

12.0 MASF PUMP TEST PERSONNEL

Project Manager. . . . . .JR Vincent
Mechanical Engineer . . . . .Brian G. Berglin
Electrical Engineer. . . . . .Charles R. Nash (Bob)
Person In Charge. . . . . .John E. Cozad

AUTOMATIC (MINI-DACS) AND MANUAL (MASF FACILITY) DATA AQUISITION

MINI DACS INSTRUMENTS	MASF FACILITY INSTRUMENTS
PUMP DISCHARGE NOZZLE PRESSURE	LDCV WATER TEMPERATURE
MOTOR STATOR TEMPERATURE	LDCV WATER LEVEL
PUMP MOTOR OIL TEMPERATURE	HEAT EXCHANGER, OIL TEMPERATURES
VOLUTE PRESSURE	OIL PUMP RPM
MOISTURE ELEMENT	HEAT EXCHANGER, COOLANT WATER TEMPERATURES
PUMP CASING VIBRATION	MOTOR OIL COOLING WATER FLOW
PUMP COLUMN STRAIN GAUGES	
PUMP COLUMN NITROGEN PRESSURE	
PUMP POSITION RESOLVER	
PUMP SHROUD NITROGEN PRESSURE	
OIL PUMP DISCHARGE PRESSURE	
MOTOR OIL PRESSURE STATOR BOTTOM	
CLOCKWISE LIMIT SWITCH	
COUNTER CLOCKWISE LIMIT SWITCH	
MOTOR VOLTAGE	
MOTOR AMPS	
PUMP SPEED	

MANUAL PUMP TEST LOG
101SY-HMR#3 4A-96-92/W

DATE/TIME	MIXER PUMP SPEED (RPM)	LDCV TEMP (°F)	LDCV WATER LEVEL (FT)	OIL PUMP TEMP IN (°F)	OIL PUMP TEMP OUT (°F)	OIL PUMP (RPM)	INLET CW PRESS (PSI)	INLET CW TEMP (°F)	OUTLET CW TEMP (°F)	CW FLOW (GPM)	INIT
960708 1912	600	79	36	NIU	NIU	NIU	NIU	NIU	NIU	NIU	DLC
960708 1927	800	78.7	36	NIU	NIU	NIU	NIU	NIU	NIU	NIU	DLC
960708 1943	1000	78.8	36	NIU	NIU	NIU	NIU	NIU	NIU	NIU	DLC
960708 1958	1200	79.1	36	NIU	NIU	NIU	NIU	NIU	NIU	NIU	DLC
960708 2012	1200	79.3	36	NIU	NIU	NIU	NIU	NIU	NIU	NIU	DLC
960708 2112	1200	81.3	36	NIU	NIU	NIU	NIU	NIU	NIU	NIU	DLC
960708 2212	1200	83.2	36	NIU	NIU	NIU	NIU	NIU	NIU	NIU	DLC
960708 2312	1200	85.5	36	NIU	NIU	NIU	NIU	NIU	NIU	NIU	DLC
960709 0012	1185	88.7	36	NIU	NIU	NIU	NIU	NIU	NIU	NIU	AKB
960709 0114	1185	90.3	36	NIU	NIU	NIU	NIU	NIU	NIU	NIU	AKB
960709 0215	1185	92.4	36	NIU	NIU	NIU	NIU	NIU	NIU	NIU	AKB
960709 0313	1185	95	36	NIU	NIU	NIU	NIU	NIU	NIU	NIU	AKB
960709 0410	1185	96.5	36	NIU	NIU	NIU	NIU	NIU	NIU	NIU	AKB
960709 0516	1185	98.8	36	NIU	NIU	NIU	NIU	NIU	NIU	NIU	AKB
960709 0608	1185	101.1	36	NIU	NIU	NIU	NIU	NIU	NIU	NIU	AKB
960709 0711	1185	103.4	36' 2"	NIU	NIU	NIU	NIU	NIU	NIU	NIU	AKB
960709 0814	1200	104	36' 2"	NIU	NIU	NIU	NIU	NIU	NIU	NIU	AKB
960709 0919	1200	105.8	36' 2"	NIU	NIU	NIU	NIU	NIU	NIU	NIU	AKB
960709 0954	N/A	N/A	N/A	NIU	NIU	200	NIU	NIU	NIU	NIU	RTB
960709 0956	N/A	N/A	N/A	NIU	NIU	400	NIU	NIU	NIU	NIU	RTB
960709 0958	N/A	N/A	N/A	NIU	NIU	600	NIU	NIU	NIU	NIU	RTB
960709 1000	N/A	N/A	N/A	NIU	NIU	1000	NIU	NIU	NIU	NIU	RTB
960709 1002	N/A	N/A	N/A	NIU	NIU	1300	NIU	NIU	NIU	NIU	RTB
960709 1004	N/A	N/A	N/A	NIU	NIU	1600	NIU	NIU	NIU	NIU	RTB
960709 1006	N/A	N/A	N/A	152	152	1800	NIU	NIU	NIU	NIU	RTB
960709 1012	1200	109.6	36' 2"	N/A	N/A	N/A	NIU	NIU	NIU	NIU	RTB

MANUAL PUMP TEST LOG
101SY-HMR#3 4A-96-92/W

DATE/TIME	MIXER PUMP SPEED (RPM)	LDCV TEMP (°F)	LDCV WATER LEVEL (FT)	OIL PUMP TEMP IN (°F)	OIL PUMP TEMP OUT (°F)	OIL PUMP (RPM)	INLET CW PRESS (PSI)	INLET CW TEMP (°F)	OUTLET CW TEMP (°F)	CW FLOW (GPM)	INIT
960709 1035	N/A	N/A	N/A	153	153	1800	NIU	NIU	NIU	NIU	RTB
960709 1114	1200	112.9	36' 3"	N/A	N/A	N/A	NIU	N/A	N/A	N/A	RTB
960709 1214	1200	115.2	36' 3"	N/A	N/A	N/A	NIU	N/A	N/A	N/A	ING
960709 1305	1200	116.9	36' 6"	147.3	125.9	1800	NIU	69	85	10.9	RTB
960709 1356	1200	117.4	36' 1"	130.6	107.6	1800	NIU	70	80	11	RTB
960709 1420	1200	117.7	35' 7"	133.5	118.6	1800	NIU	70	80	11	RTB
960709 1425	1200	117.7	35' 8"	133.5	118.6	1800	NI	70	80	5	RTB
960709 1453	1200	118.4	36' 0"	134.6	121.9	1800	85	70	86	5	RTB
960709 1533	1200	119.5	36' 6"	135.4	121.7	1800	85	70	87	4.7	LJL
960709 1604	1200	120.5	35' 5"	135.5	121.8	1800	85	70	88	5	RTB
960709 1638	1200	120.7	35' 2"	104.5	81.7	NIU	84	70	72	6	RTB
960709 1725	1200	121.4	35'10"	90.8	76.1	NIU	84	70	72	6	RTB
960709 1830	1200	121.9	36' 2"	82.1	74.9	NIU	64	70	72	6	RTB
960709 1832	1200	121.9	36' 2"	82.1	74	NIU	64	70	72	7	RTB
960709 2133	1200	122.4	36' 1"	125.7	80	1800	82	70	78	8	RTB
960709 2236	1200	121.9	36' 3"	139.4	122.5	1800	82	70	80	8	RTB
960709 2325	1200	122.7	36' 1"	138.8	123.6	1800	82	70	80	8	RTB
960710 0025	1200	123	36' 1"	140.6	123	1800	82	70	80	8	ING
960710 0125	1200	124.1	36' 1"	141.2	124.2	1800	82	70	80	8	ING
960710 0225	1200	125.2	36' 5"	141.1	138.2	1800	82	70	80	8	ING
960710 0325	1200	126.3	36' 1"	144.9	127	1800	82	70	80	8	ING
960710 0425	1200	128	35' 5"	142.7	126	1800	82	70	80	7	ING
960710 0525	1200	128.9	> 35	140.1	124.9	1800	82	70	80	8	ING
960710 0625	1200	130	>35	142.1	125.3	1800	82	70	80	8	ING
960710 0725	1200	131	> 35	143	126.8	1800	82	70	80	8	ING
960710 0844	1200	128.4	36' 6"	142.1	125.1	1800	82	70	76	8	MBM

MANUAL PUMP TEST LOG

101SY-HMR#3 4A-96-92/W

DATE/TIME	MIXER PUMP SPEED (RPM)	LDCV TEMP (°F)	LDCV WATER LEVEL (FT)	OIL PUMP TEMP IN (°F)	OIL PUMP TEMP OUT (°F)	OIL PUMP (RPM)	INLET CW PRESS (PSI)	INLET CW TEMP (°F)	OUTLET CW TEMP (°F)	CW FLOW (GPM)	INIT
960710 0936	1200	127.2	36' 1"	142.8	124.8	1800	65	70	80	10.6	LJL
960710 1033	1200	126.8	36' 1"	151.2	132.7	1800	78	70	78	11.2	RTB
960710 1133	1200	127.6	35' 9"	152.2	133	1800	78	70	78	11.7	LJL
960710 1231	1200	127.3	36' 5"	143.7	127.4	1800	78	70	78	11.2	LJL
960710 1337	1200	127.3	36' 3"	152.3	133.4	1800	78	70	78	11.7	RTB
960710 1439	1200	127.2	36' 2"	145	127.4	1800	79	70	77	11.7	MBM
960710 1540	1200	127.7	36' 0"	143.8	127.6	1800	79	70	76	11.8	MBM
960710 1633	1200	128.2	36" 1"	144.4	128.5	1800	80	70	77	11.8	MBM
960710 1734	1200	128.2	36' 3"	144.9	128.5	1800	80	70	77	11.7	MBM
960710 1831	1200	128	35'10"	145.5	128.7	1800	77	70	77	11.6	MBM
960710 1934	1200	128.2	36' 1"	145.1	128.6	1800	79	70	76	11.7	MBM
960710 2032	1200	128.3	36' 6"	144.1	129.3	1800	64	70	76	11.6	MBM
960710 2132	1200	127.9	35'11"	144.6	128.2	1800	78	70	75	11.6	MBM
960710 2234	1200	128	36' 3"	144.8	129.2	1800	80	70	76	11.7	MBM
960710 2330	1200	128.6	36' 4"	145.1	128.5	1800	62	70	76	10.5	MBM
960711 0029	1200	127.8	36' 4"	142.5	128.7	1800	79	70	74	11.8	DLC
960711 0130	1200	128.1	36'4"	151.3	133.5	1800	79	70	77	11.5	DLC
960711 0229	1200	128.3	36' 3"	148.2	134	1800	79	70	78	11.5	DLC
960711 0330	1200	128.5	36' 1"	141.1	126.9	1800	78	70	78	11.5	DLC
960711 0430	1200	128.5	36' 0"	139.3	127.6	1800	80	70	77	11.5	DLC
960711 0530	1200	128.4	36' 1"	141.7	127.7	1800	80	70	77	11.6	DLC
960711 0630	1200	129.1	36' 0"	105.2	86.2	0	69	70	74	0	DLC
960711 0758	1200	128.1	36' 2"	133	118.2	1800	74	70	72	NIU	MBM
960711 0840	1200	127.5	36' 2"	150	156.8	1800	74	70	92	NIU	RTB
960711 0935	1200	127.5	36' 2"	132.6	132	1800	75	70	96	NIU	RTB
960711 0950	1200	127.5	36' 2"	132.6	132.6	1800	81	70	96	8	RTB

MANUAL PUMP TEST LOG
101SY-HMR#3 4A-96-92/W

DATE/TIME	MIXER PUMP SPEED (RPM)	LDCV TEMP (°F)	LDCV WATER LEVEL (FT)	OIL PUMP TEMP IN (°F)	OIL PUMP TEMP OUT (°F)	OIL PUMP (RPM)	INLET CW PRESS (PSI)	INLET CW TEMP (°F)	OUTLET CW TEMP (°F)	CW FLOW (GPM)	INIT
960711 1044	1200	127.2	36' 3"	142.7	128	1800	79	72	76	8	RTB
960711 1131	1200	127.2	36' 0"	145.3	157.1	1800	72	72	80	NIU	RTB
960711 1231	1200	126.8	36 '0"	126.4	140	1800	70	72	83	NIU	ING
960711 1330	1200	126.3	35'10"	95.9	93.4	NIU	70	NIU	84	NIU	ING
960711 1430	1200	126.8	35'10"	83.9	82	•	70	92	78	NIU	RTB
960711 1541	1200	127.4	36' 0"	77.4	76.9	•	70	62	74	NIU	RTB
960711 1630	1200	127.3	36' 1"	76.4	74.7	•	70	84	72	NIU	ING
960711 1730	1200	126.8	35'11"	74.9	74.4	•	70	74	62	NIU	ING
960711 1830	1200	126.8	35'11"	74.7	74.3	•	70	74	58	NIU	ING
960711 1930	1200	125.8	36' 0"	74.8	74.3	•	70	74	60	NIU	ING
960711 2030	1200	124	35'11"	74.5	74.3	•	70	74	58	NIU	ING
960711 2130	1200	122.9	35' 9"	74.1	74.1	•	70	74	56	NIU	ING
960711 2230	1200	120	35'11"	73.8	73.8	•	70	74	15	NIU	ING
960711 2330	1200	121.8	36' 1"	73.3	73.4	•	70	74	20	NIU	ING

N/A - Not Applicable
NIU - Not In Use

TEMPERATURE CALIBRATIONS RECORDS

INSTRUMENT NO.	INSTRUMENT NAME	DACS READINGS	TEMPERATURES (°F)					ALARMS			
								HIGH	RESET	ABORT	RESET
		INPUT	**50**	**100**	**150**	**200**	**250**	**220**		**250**	
TIPN0202	WST-TE-3127M MOTOR STATOR TEMPERATURE	AS FOUND	51.8	101.5	151.8	201.5	251.6	221.7	217.7	150.2	149.8
		AS LEFT	51.8	101.5	151.8	201.5	251.6	221.7		250	
TIPN0101	WST-TE-3127P MOTOR STATOR TEMPERATURE	AS FOUND	52.4	101.9	152.2	201.9	251.8	220.6	218.6	150.9	149.6
		AS LEFT	52.4	101.9	152.2	201.9	251.8	220.6		250	
SPARE 3	WST-TE-3127R MOTOR STATOR TEMPERATURE	AS FOUND	54.2	103.4	153.5	203	252.9	220			
		AS LEFT	54.2	103.4	153.5	203	252.9	220			
		INPUT	**100Ω**	**110Ω**	**120Ω**	**130Ω**	**140Ω**	**140.202Ω**		**146.496Ω**	
			32	**78**	**125**	**172**	**219**	**220**		**250**	
TIR12A01	WST-TE-312M PUMP MOTOR OIL TEMPERATURE	AS FOUND	29.5	74	119.1	165.7	212.4		219.9		NA
		AS LEFT	32.1	78.4	124.8	171.9	219.3	220.2		250	
TIR12A02	WST-TE-312P PUMP MOTOR OIL TEMPERATURE	AS FOUND	32.1	76.6	124.8	171.9	219.2	220.2	219.8	249.8	NA
		AS LEFT	32.1	76.6	124.8	171.9	219.2	220.2		249.8	
SPARE 7	WST-TE-313M PUMP MOTOR OIL TEMPERATURE	AS FOUND	32.8	78.3	124.5	171.7	219	NA	NA	NA	NA
		AS LEFT	32.8	78.3	124.5	171.7	219	NA		NA	
SPARE 8	WST-TE-313P PUMP MOTOR OIL TEMPERATURE	AS FOUND	31.8	78.3	124.7	171.7	219.1	220.1	NA	NA	
		AS LEFT	31.8	78.3	124.7	171.7	219.1	NA		NA	

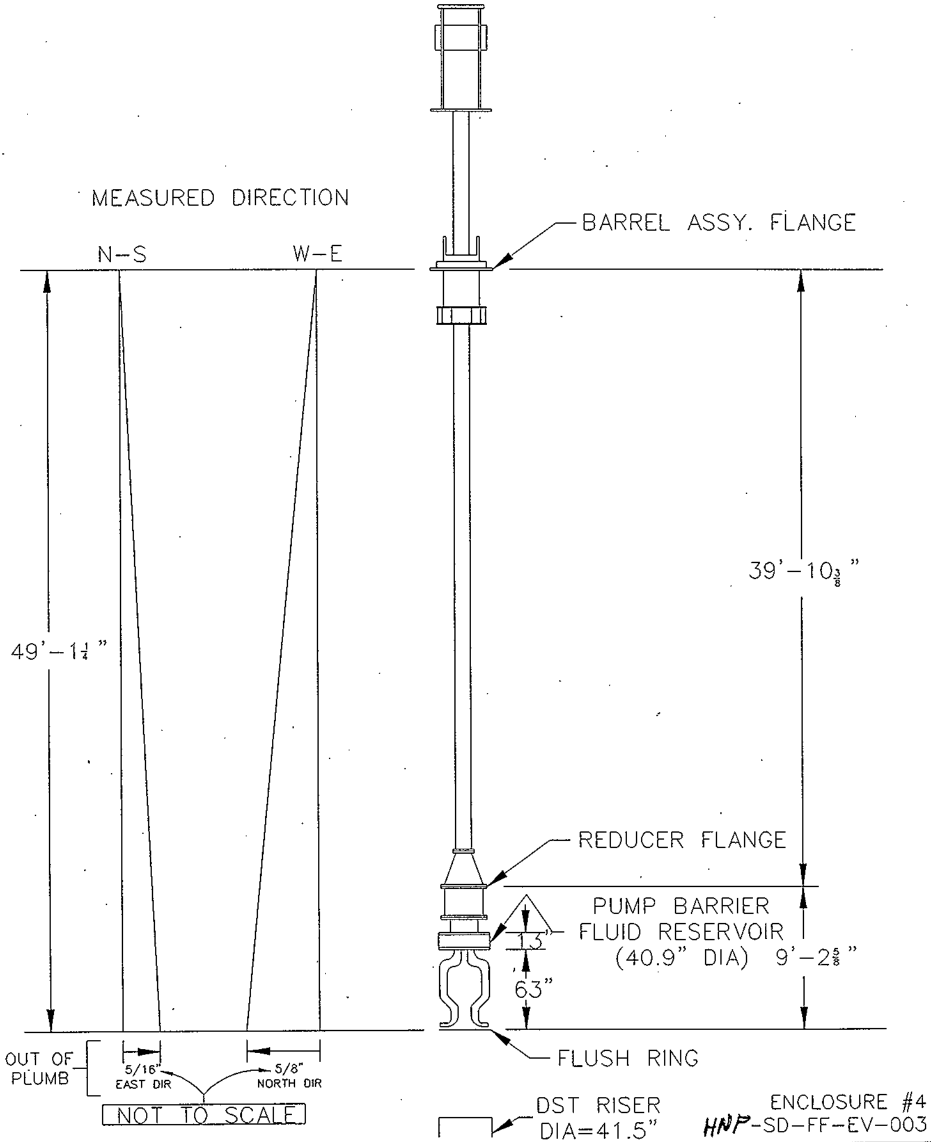
PRESSURE CALIBRATION RECORDS

INSTRUMENT NO.	INSTRUMENT NAME	DACS READINGS	PRESSURE (PSIG)					ALARMS			
								HIGH	RESET	ABORT	RESET
		INPUT	**10**	**25**	**35**	**45**	**60**				
PITNO110	WST-PI-3106M PUMP 30° NOZZLE DP	AS FOUND	10.4	25.1	35	44.9	59.8				
		AS LEFT	10.4	25.1	35	44.9	59.8				

PRESSURE CALIBRATION RECORDS (CONTINUED)

INSTRUMENT NO.	INSTRUMENT NAME	DACS READINGS	PRESSURE (PSIG)					ALARMS			
								HIGH	RESET	ABORT	RESET
		INPUT	**10**	**25**	**35**	**45**	**60**				
SPARE 1	WST-PI-3106P PUMP 30° NOZZLE DP	AS FOUND	9.8	24.6	34.7	44.8	60				
		AS LEFT	9.8	24.6	34.7	44.8	60				
		INPUT	**10**	**25**	**35**	**45**	**60**				
PITNO111	WST-PI-3105M PUMP #1 NOZZLE DP	AS FOUND	10.7	25.6	35.7	45.4	60.1				
		AS LEFT	10.7	25.6	35.7	45.4	60.1				
SPARE 2	WST-PE-3105P PUMP #1 NOZZLE DP	AS FOUND	9.9	24.9	35.1	45	59.8				
		AS LEFT	9.9	24.9	35.1	45	59.8				
		INPUT	**5**	**10**	**15**	**20**	**25**				
PN2P0506	WST-PI-3103M PUMP SHROUD NITROGEN PRESSURE	AS FOUND	3.88	8.9	13.94	19	23.97				
		AS LEFT	5.06	10.05	15.07	20.11	25.03				
ZIMPE142	WST-PI-3102P PUMP COLUMN NITROGEN PRESSURE	AS FOUND	5	10	15	20	25				
		AS LEFT	5	10	15	20	25				
		INPUT	**25**	**50**	**75**	**100**	**125**				
PIR12A01	WST-PE-3123M PUMP VOLUTE PRESSURE	AS FOUND	41.6	65.9	91.5	117.1	142.8				
		AS LEFT	41.6	65.9	91.5	117.1	142.8				
		INPUT	**10**	**20**	**30**	**40**	**50**	**35**		**40**	
PN2P0507	WST-PE-3104M OIL PUMP DISCHARGE PRESSURE	AS FOUND	10.05	20.23	30.22	40.53	50.62	35			
		AS LEFT	10.05	20.23	30.22	40.53	50.62	35			
MOBSTAB	MOTOR STATOR OIL PRESSURE BOTTOM	AS FOUND	5	10	15	20	25	30			
		AS LEFT									

HYDROGEN MITIGATION/RETRIEVAL PUMP-3
(VERTICAL PLUMBNESS)



ENCLOSURE #4
HNP-SD-FF-EV-003

Mail to: WESTINGHOUSE HANFORD CO
2355 STEVENS DR / MSIN H5-09
RICHLAND WA 99352

Attn: RAY SCHWEHR/ TONY BENEGAS

OIL ANALYSIS LAB, INC.

EQUIPMENT CONDITION REPORT

1514 East Sprague • Spokane, WA 99202
P.O. Box 3928 • Spokane, WA 99220-3928

TOLL FREE: 1-800-366-8596

LOCAL: (509) 535-9791

Code Explanation
A Normal (no action required)
B Moderate (requires monitoring)
C High (action indicated)
D Severe (immediate action)
X Impending failure

Customer Account No: 9594622WESTING
Unit Number: 100-BARRIER/MECHSEAL
Compartment: BARRIER/MECH SEAL USED
Compartment Location:
Equipment Make & Model: 200 HP ELECTRIC MOTOR
Manuf. of Compartment: HAZELTON TYPE SSB
Oil Capacity: 5
Type/SAE Oil Used: CHEVRON GST 32
Phone: 509 376-7981
Work Site:

Sample Information			Physical Data							Metal Concentrations (In parts per million by weight)										Additives										
CURRENT Sample Number	Service Meter Reading: Since New or O/H	Service Meter Reading: Since Oil Change	Viscosity @ 100°C (cSt)	Fuel Dilution %	Soot	Oxidation	Nitration	Water %	Anti-freeze %	Silicon	Iron	Chromium	Aluminum	Copper	Lead	Tin	Nickel	Silver	Molybdenum	Magnesium	Sodium	Titanium	Boron	Vanadium	Calcium	Zinc	Barium	Phosphorus	TAN	TBN
96418	72	72	5.5	0	0	0	0	0.04	0.00	50	2	0	0	0	0	0	0	0	0	5	1	0	1	0	57	527	0	156		
			A	A				A	A	C	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A		

THIS REPORT IS CHECKED TWICE FOR ACCURACY

IF YOU HAVE ANY QUESTIONS CALL

CHECKED BY: AB DATE 7.18.96

Page 1

MAINTENANCE RECOMMENDATIONS

Report Date 07/18/96
CURRENT SAMPLE TAKEN ON 07/12/96

96418 NOTE SILICON
07/17/96 VISCOSITY TEST IS REPORTED IN CENTISTOKES (cSt).

WATER - 351 PPM

Current Sample

ENCLOSURE #5
HNF-SD-FF-EV-003
PAGE 1

Mail to: WESTINGHOUSE HANFORD CO
2355 STEVENS DR / MSIN H5-09
RICHLAND WA 99352

Attn: RAY SCHMEHR/ TONY BENEGAS

TOLL FREE: 1-800-366-8596

LOCAL: (509) 535-9791

OIL ANALYSIS LAB, INC.

EQUIPMENT CONDITION REPORT

1514 East Sprague • Spokane, WA 99202
P.O. Box 3928 • Spokane, WA 99220-3928

Code Explanation
A Normal (no action required) B Moderate (requires monitoring) C High (action indicated) D Severe (immediate action) X Impending failure

Customer Account No: 9594622WESTING
Unit Number: 200-ELECTRICMOTOR
Compartment: ELECTRIC MOTOR USED
Compartment Location:
Equipment Make & Model: 200HP HAZELTON TYPE SSB
Manuf. of Compartment: 34
Oil Capacity:
Type/SAE Oil Used: SHELL HYPERIA
Phone: 509 376-7981
Work Site:

Sample Information			Physical Data							Metal Concentrations In parts per million by weight									Additives											
Sample Number	Service Meter Reading: Since New or O/H	Service Meter Reading: Since Oil Change	Viscosity @ 100°C (cSt)	Fuel Dilution %	Soot	Oxidation	Nitration	Water %	Anti-freeze %	Silicon	Iron	Chromium	Aluminum	Copper	Lead	Tin	Nickel	Silver	Molybdenum	Magnesium	Sodium	Titanium	Boron	Vanadium	Calcium	Zinc	Barium	Phosphorus	TAN	TBN
CURRENT																														
96419	72	72	0.0	0	0	0	0	0.35	0.00	233	13	5	3	4	6	9	5	1	12	17	1	2	1	4	2	17	1	444		
			*	A				*	A	X	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A		

THIS REPORT IS CHECKED TWICE FOR ACCURACY

IF YOU HAVE ANY QUESTIONS CALL

CHECKED BY: AB DATE: 7.18.96

MAINTENANCE RECOMMENDATIONS

Report Date 07/18/96
CURRENT SAMPLE TAKEN ON 07/12/96

96419 NOTE SILICON
07/17/96 NOTE WATER CONTAMINATION.

TOO MUCH WATER FOR VISCOSITY TEST.
WATER - 3494 PPM

Current Sample

Page 2

ENCLOSURE #5
HNF-SD-FF-EV-003
PAGE 2

Mail to: WESTINGHOUSE HANFORD CO
2355 STEVENS DR / MSIN H5-09
RICHLAND WA 99352

Attn: RAY SCHWEHR/ TONY BENEGAS

TOLL FREE: 1-800-366-8596

LOCAL: (509) 535-9791

OIL ANALYSIS LAB, INC.

EQUIPMENT CONDITION REPORT

1514 East Sprague • Spokane, WA 99202
P.O. Box 3928 • Spokane, WA 99220-3928

Code Explanation
A Normal (no action required)
B Moderate (requires monitoring)
C High (action indicated)
D Severe (immediate action)
X Impending failure

Customer Account No: 9594622WESTING
Unit Number: 300-ELECTRICMOTOR
Compartment: ELECTRIC MOTOR
Compartment Location:
Equipment Make & Model: FROM FILTER
Manuf. of Compartment:
Oil Capacity: 0
Type/SAE Oil Used: SEHLL HYPERIA
Phone: 509 376-7981
Work Site:

Sample Information: Sample Number	Service Meter Reading: Since New or O/H	Service Meter Reading: Since Oil Change	Physical Data: Viscosity @ 100°C (cSt)	Fuel Dilution %	Soot	Oxidation	Nitration	Water %	Anti-freeze %	Metal Concentrations (in parts per million by weight): Silicon	Iron	Chromium	Aluminum	Copper	Lead	Tin	Nickel	Silver	Additives: Molybdenum	Magnesium	Sodium	Titanium	Boron	Vanadium	Calcium	Zinc	Barium	Phosphorus	TAN	TBN
CURRENT																														
96420	72	72	9.0	0	0	0	0	0.31	0.00	233	13	4	3	4	5	8	4	1	11	14	1	2	1	3	2	17	1	447		
			*	A				*	A	X	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A		

THIS REPORT IS CHECKED TWICE FOR ACCURACY

✔ ✔

IF YOU HAVE ANY QUESTIONS CALL

CHECKED BY: AB DATE: 7 18 96

Page 3

MAINTENANCE RECOMMENDATIONS

Report Date 07/18/96
CURRENT SAMPLE TAKEN ON 07/12/96

ENCLOSURE #5
HNF-SD-FF-EV-003
PAGE 3

96420 NOTE SILICON
07/17/96 NOTE WATER CONTAMINATION.

TOO MUCH WATER FOR VISCOSITY TEST.
WATER - 3065 PPM

Current Sample

Mail to: WESTINGHOUSE HANFORD CO
2355 STEVENSON / MS G1-59

RICHLAND WA 99352

Attn: A R HENDRICKSON/ TONY BENEGAS

TOLL FREE: 1-800-356-8596

LOCAL: (509) 535-9791

OIL ANALYSIS LAB, INC.

EQUIPMENT CONDITION REPORT

1514 East Sprague • Spokane, WA 99202
P.O. Box 3928 • Spokane, WA 99220-3928

Code Explanation
A Normal (no action required) B Moderate (requires monitoring) C High (action indicated) D Severe (immediate action) X Impending failure

Customer Account No: 9594622WESTING
Unit Number: 200
Compartment:
Compartment Location:
Equipment Make & Model:
Manuf. of Compartment: 0
Oil Capacity:
Type/SAE Oil Used: HYPERIA S220
Phone: 509 376-7901
Work Site:

Sample Information			Physical Data						
	Service Meter Reading								
CURRENT Sample Number	Since New or O/H	Since Oil Change	Viscosity @ 100°C (cSt)	Fuel Dilution %	Soot	Oxidation	Nitration	Water %	Anti-freeze %
96780	0	0	0.0	0	0	0	0	0.31	0.00
			*	A				*	A

Sample Number	Metal Concentrations In parts per million by weight									Additives											
	Silicon	Iron	Chromium	Aluminum	Copper	Lead	Tin	Nickel	Silver	Molybdenum	Magnesium	Sodium	Titanium	Boron	Vanadium	Calcium	Zinc	Barium	Phosphorus	T/N	T??
96780	230	13	4	2	4	5	6	4	1	0	13	1	2		4	2	14	1	441		
	C	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A		

MAINTENANCE RECOMMENDATIONS

Report Date 07/21/96
CURRENT SAMPLE TAKEN ON 07/23/96

96780 NOTE SILICON
07/23/96 NOTE WATER CONTAMINATION.

TOO MUCH WATER FOR VISCOSITY TEST.
WATER - 3155 PPM

Page 4

Current Sample

ENCLOSURE #5
HNF-SD-FF-EV-003
PAGE 4

OIL ANALYSIS LAB, INC.

EQUIPMENT CONDITION REPORT

1514 East Sprague • Spokane, WA 99202
P.O. Box 3928 • Spokane, WA 99220-3928

Mail to: WESTINGHOUSE HANFORD CO
2355 STEVENS DR / MS G1-59

RICHLAND WA 99352

Attn: D R HENDRICKSON/ TONY BENEGAS

TOLL FREE: 1-800-366-8596

LOCAL: (509) 535-9791

Customer Account No: 9594622WESTING
Unit Number: 400
Compartment: NEW OIL
Compartment Location:
Equipment Make & Model:
Manuf. of Compartment:
Oil Capacity: 0
Type/SAE Oil Used: HYPERIA S226
Phone: 509 376-7931
Work Site:

Code Explanation
A Normal (no action required)
B Moderate (requires monitoring)
C High (action indicated)
D Severe (immediate action)
X Impending failure

Sample Information			Physical Data							Metal Concentrations In parts per million by weight									Additives											
	Service Meter Reading																													
Sample Number	Since New or O/H	Since Oil Change	Viscosity @ 100°C (cSt)	Fuel Dilution %	Soot	Oxidation	Nitration	Water %	Anti-freeze %	Silicon	Iron	Chromium	Aluminum	Copper	Lead	Tin	Nickel	Silver	Molybdenum	Magnesium	Sodium	Titanium	Boron	Vanadium	Calcium	Zinc	Barium	Phosphorus	TAN	TBN
CURRENT																														
96781	0	0	24.5	0	0	0	0	0.01	0.00	27	1	4	1	[illegible]	4	4	4	1	6	14	1	1	1	3	0	2	1	446		
			*	A				A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A		

MAINTENANCE RECOMMENDATIONS

Report Date 07/21/96
CURRENT SAMPLE TAKEN ON 07/23/96

96781 OIL APPEARS TO BE THICK FOR TYPE GIVEN
07/23/96 VISCOSITY TEST IS REPORTED IN CENTISTOKES (cSt).

WATER-64 PPM / VIS. CONSISTANT WITH S320

Page 5

Current Sample

ENCLOSURE #5
HNF-SD-FF-EV-003
PAGE 5

Mail to: WESTINGHOUSE HANFORD CO
2355 STEVENS DR / MS G1-59

RICHLAND WA 99352

Attn: A R HENDRICKSON/ TONY BENEGAS

TOLL FREE: 1-800-366-8598

LOCAL: (509) 535-9791

OIL ANALYSIS LAB, INC.

EQUIPMENT CONDITION REPORT

1514 East Sprague • Spokane, WA 99202
P.O. Box 3928 • Spokane, WA 99220-3928

Code Explanation
A Normal (no action required) B Moderate (requires monitoring) C High (action indicated) D Severe (immediate action) X Impending failure

Customer Account No: 959462211ESTING
Unit Number: 509
Compartment: NEW OIL
Compartment Location:
Equipment Make & Model:
Manuf. of Compartment: 0
Oil Capacity: GST 32
Type/SAE Oil Used: 509 376-7901
Phone:
Work Site:

Sample Information			Physical Data							Metal Concentrations in parts per million by weight										Additives										
Sample Number	Service Meter Reading: Since New or O/H	Service Meter Reading: Since Oil Change	Viscosity @ 100°C (cSt)	Fuel Dilution %	Soot	Oxidation	Nitration	Water %	Anti-freeze %	Silicon	Iron	Chromium	Aluminum	Copper	Lead	Tin	Nickel	Silver	Molybdenum	Magnesium	Sodium	Titanium	Boron	Vanadium	Calcium	Zinc	Barium	Phosphorus	TAN	TBN
CURRENT																														
56782	0	0	5.5	0	0	0	0	0.01	0.00	1	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	6		
			A	A				A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A		

MAINTENANCE RECOMMENDATIONS

Report Date 07/21/96
CURRENT SAMPLE TAKEN ON 07/23/96

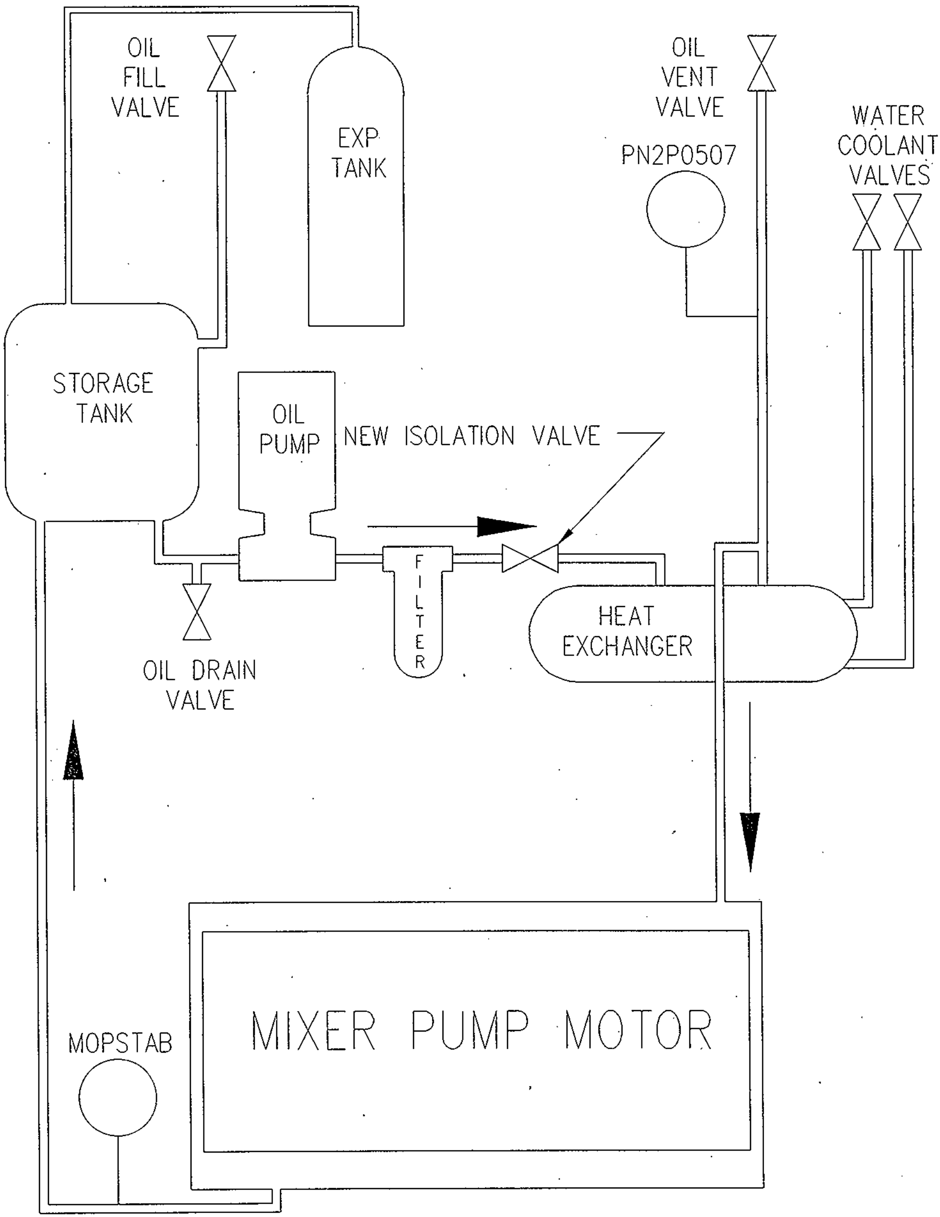
56782 TEST NORMAL FOR NEW OIL.
07/23/96 VISCOSITY TEST IS REPORTED IN CENTISTOKES (cSt).

WATER - 68 PPM

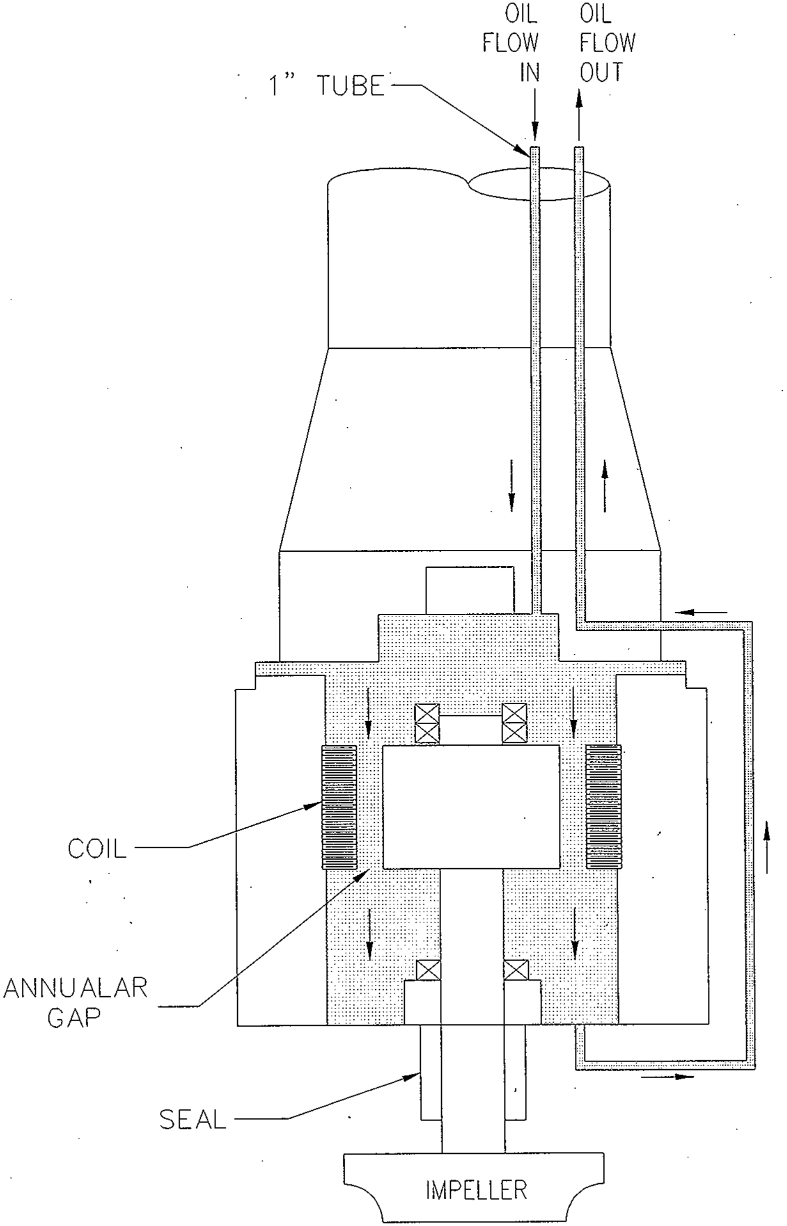
Page 6

Current Sample

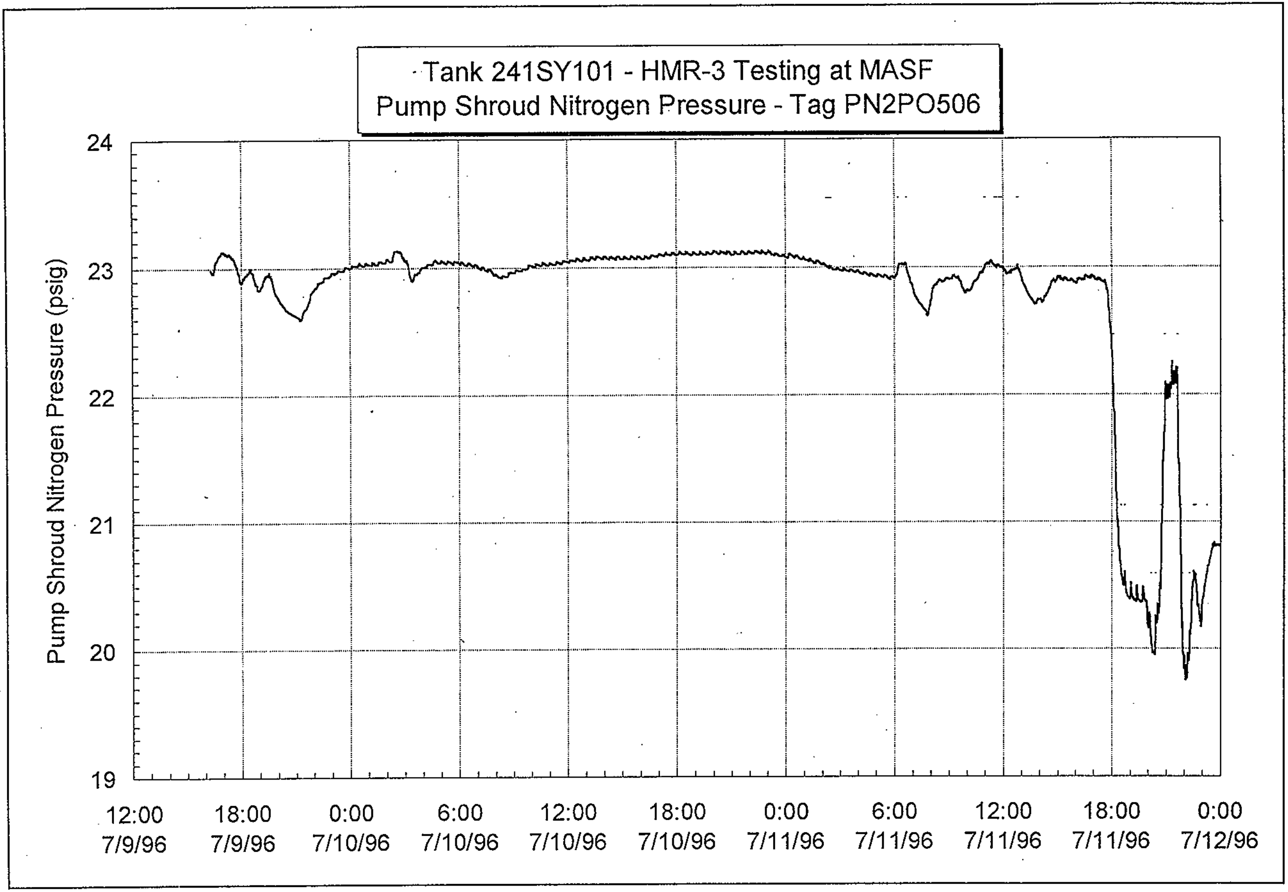
ENCLOSURE #5
HNF-SD-FF-EV-003
PAGE 6

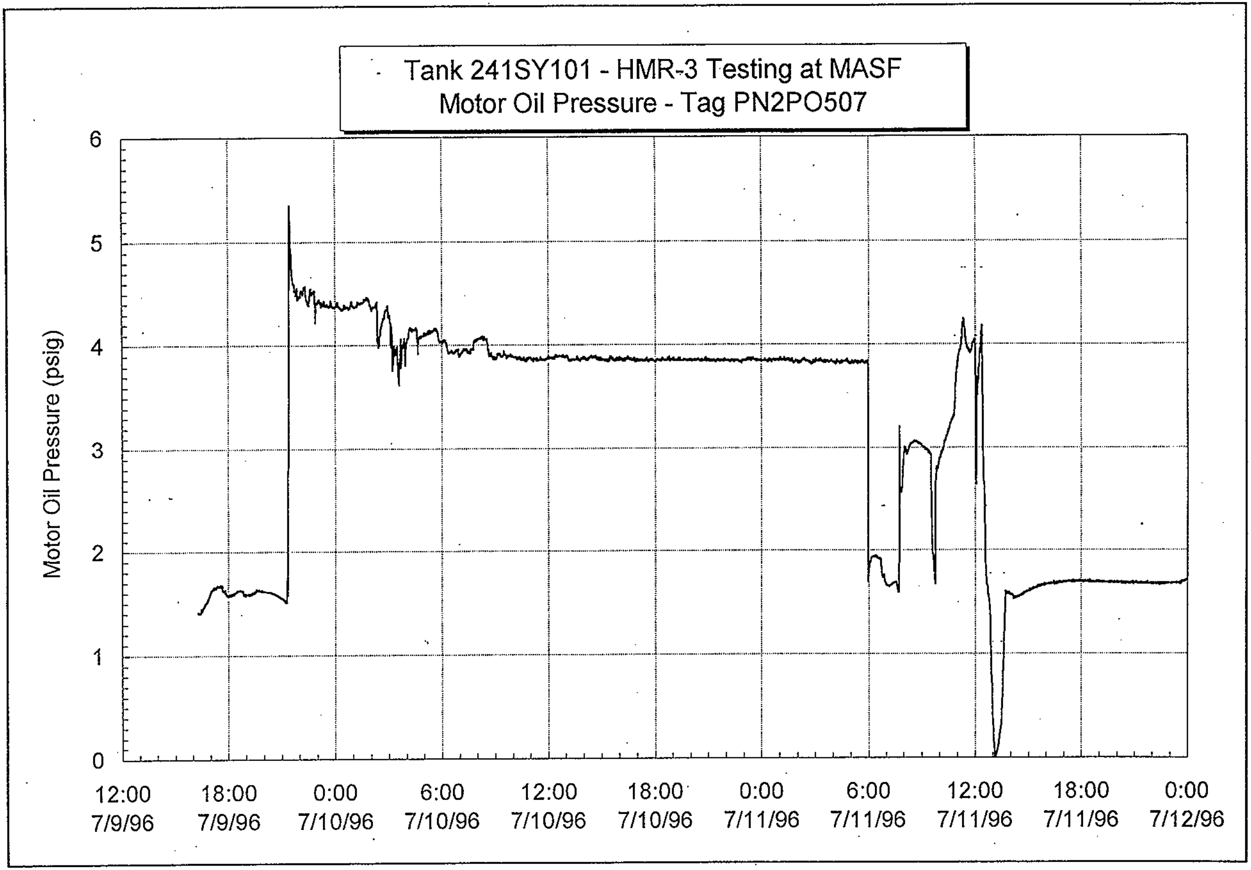


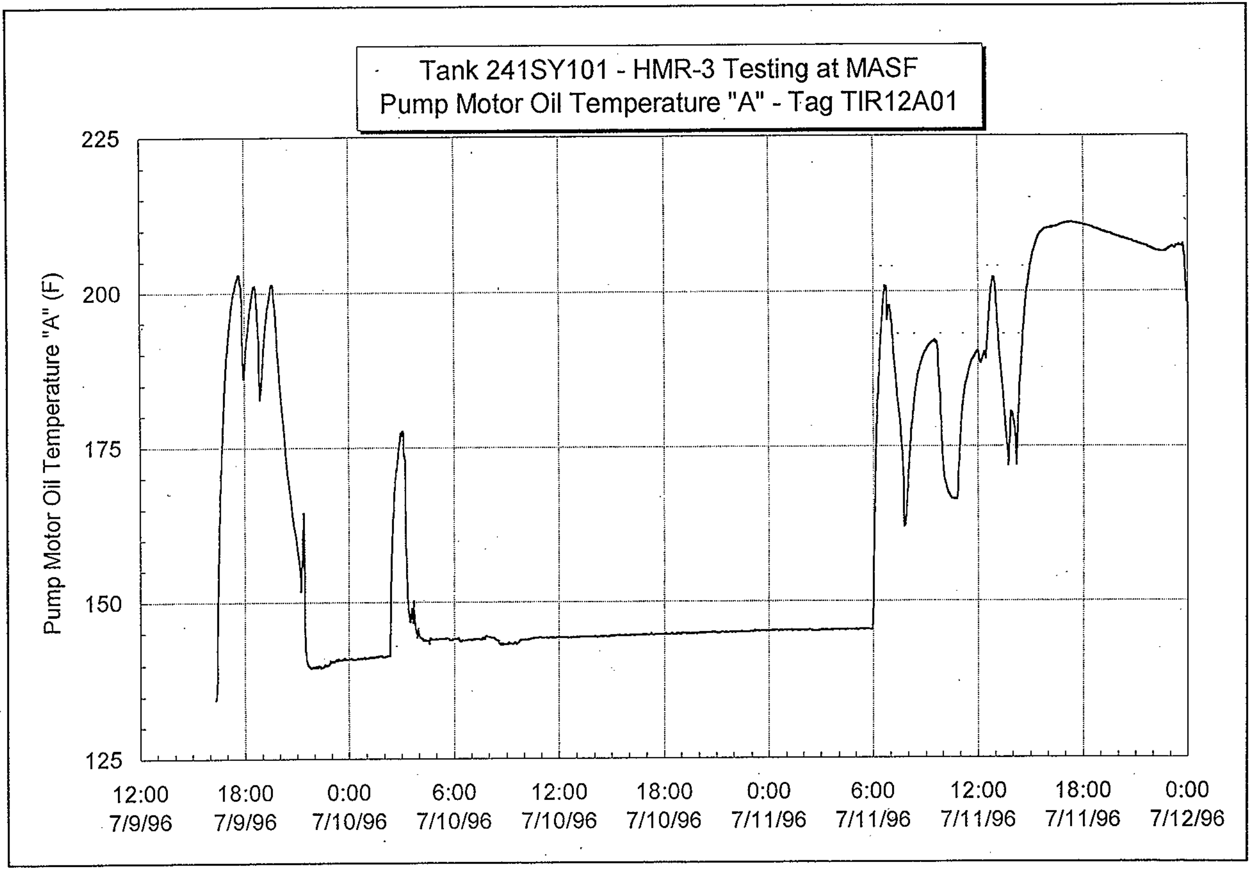
OIL SYSTEM DIAGRAM

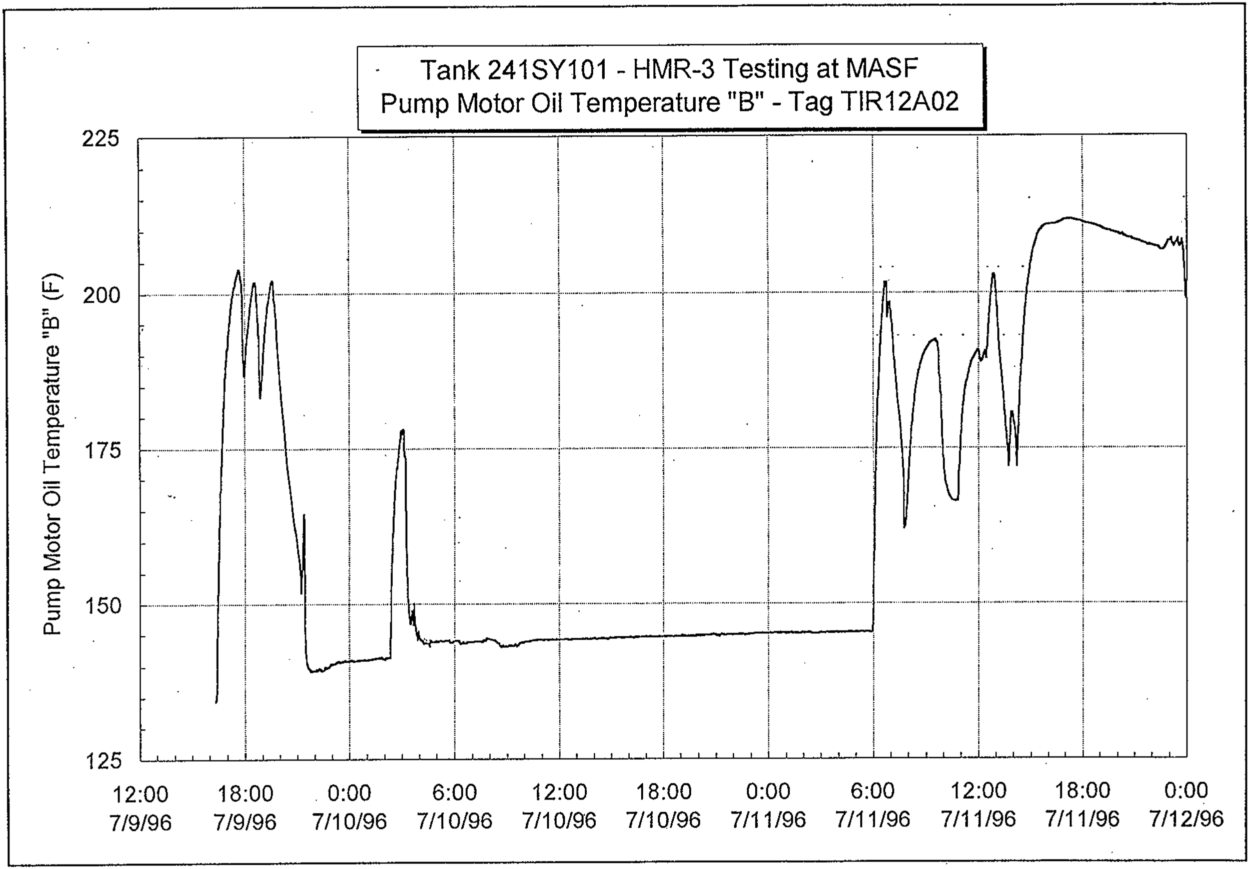


OIL FLOW THROUGH MOTOR


Tank 241SY101 - HMR-3 Testing at MASF
Pump Shroud Nitrogen Pressure - Tag PN2PO506
Pump Shroud Nitrogen Pressure (psig)
24
23
22
21
20
19
12:00 7/9/96
18:00 7/9/96
0:00 7/10/96
6:00 7/10/96
12:00 7/10/96
18:00 7/10/96
0:00 7/11/96
6:00 7/11/96
12:00 7/11/96
18:00 7/11/96
0:00 7/12/96


Tank 241SY101 - HMR-3 Testing at MASF
Motor Oil Pressure - Tag PN2PO507
Motor Oil Pressure (psig)
0
1
2
3
4
5
6
12:00 7/9/96
18:00 7/9/96
0:00 7/10/96
6:00 7/10/96
12:00 7/10/96
18:00 7/10/96
0:00 7/11/96
6:00 7/11/96
12:00 7/11/96
18:00 7/11/96
0:00 7/12/96


Tank 241SY101 - HMR-3 Testing at MASF
Pump Motor Oil Temperature "A" - Tag TIR12A01
Pump Motor Oil Temperature "A" (F)
225
200
175
150
125
12:00 7/9/96
18:00 7/9/96
0:00 7/10/96
6:00 7/10/96
12:00 7/10/96
18:00 7/10/96
0:00 7/11/96
6:00 7/11/96
12:00 7/11/96
18:00 7/11/96
0:00 7/12/96


Tank 241SY101 - HMR-3 Testing at MASF
Pump Motor Oil Temperature "B" - Tag TIR12A02
Pump Motor Oil Temperature "B" (F)
225
200
175
150
125
12:00 7/9/96
18:00 7/9/96
0:00 7/10/96
6:00 7/10/96
12:00 7/10/96
18:00 7/10/96
0:00 7/11/96
6:00 7/11/96
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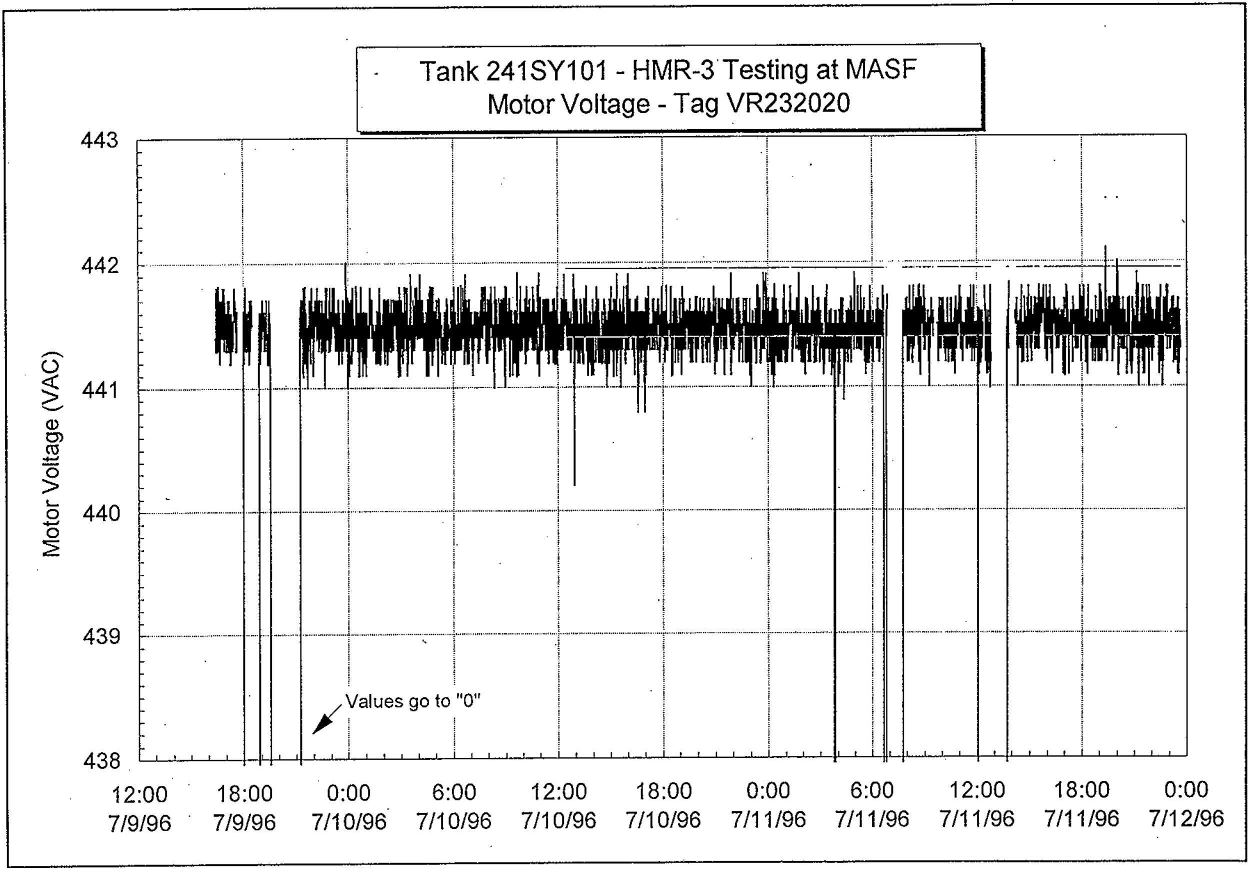
18:00 7/11/96
0:00 7/12/96



Tank 241SY101 - HMR-3 Testing at MASF
Motor Voltage - Tag VR232020
443
442
441
440
439
438
Motor Voltage (VAC)
Values go to "0"
12:00 7/9/96
18:00 7/9/96
0:00 7/10/96
6:00 7/10/96
12:00 7/10/96
18:00 7/10/96
0:00 7/11/96
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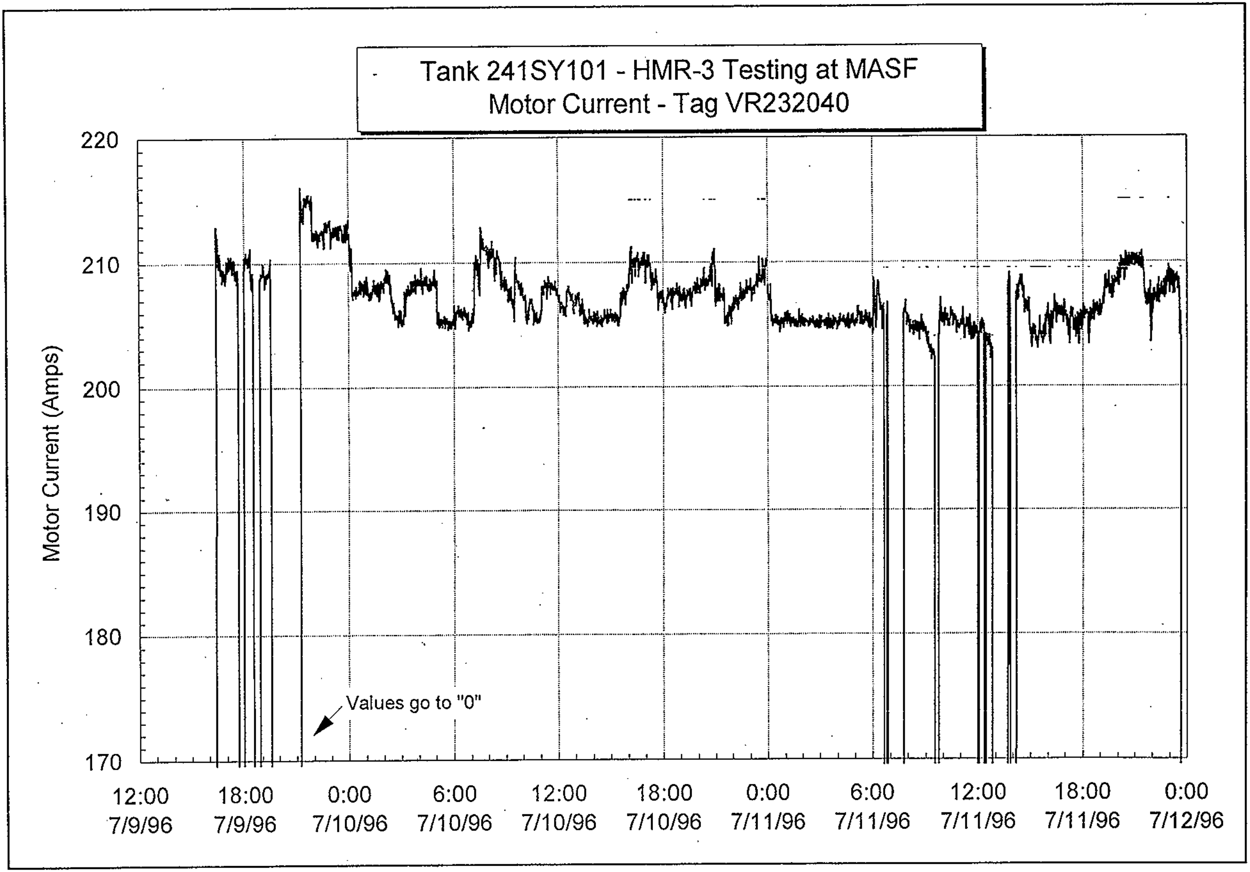
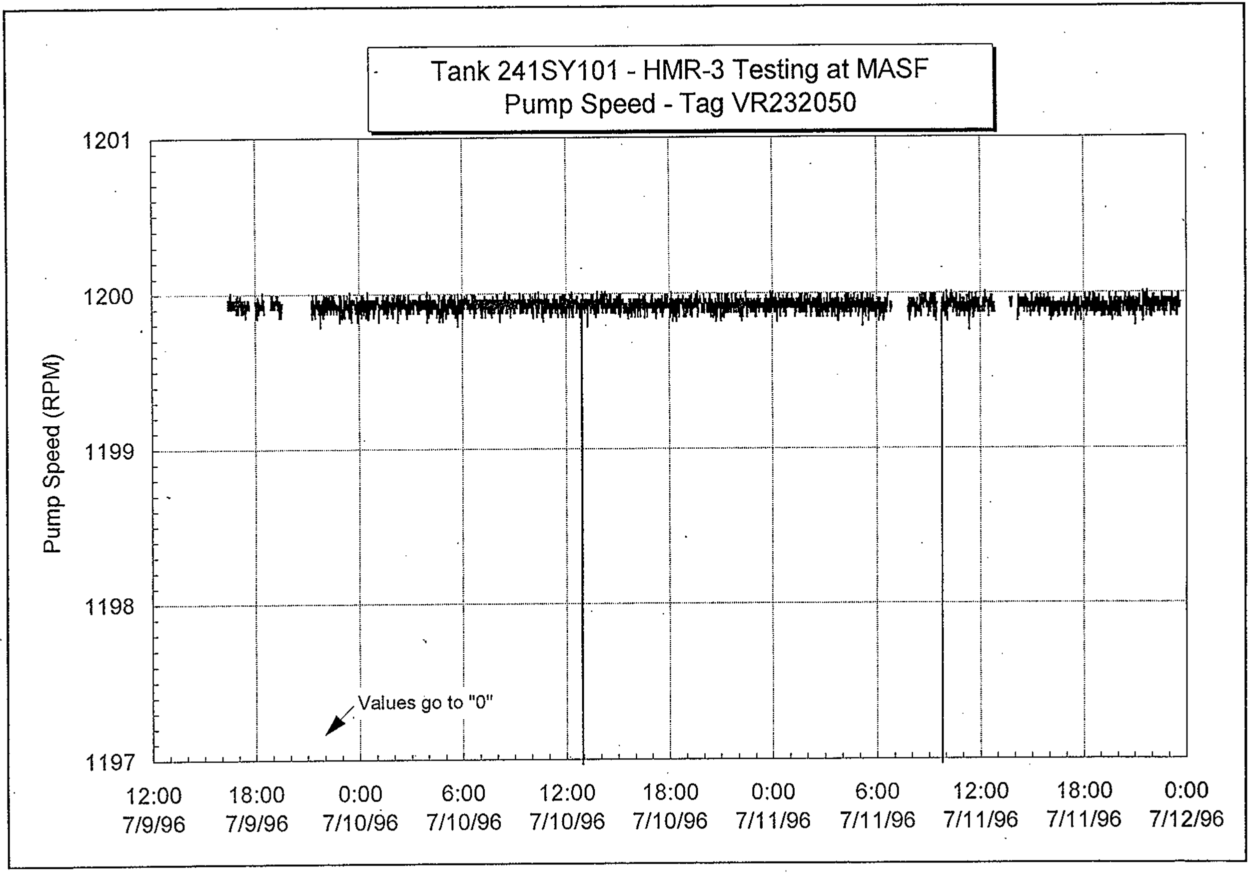
18:00 7/11/96
0:00 7/12/96



Tank 241SY101 - HMR-3 Testing at MASF
Motor Current - Tag VR232040
220
210
200
190
180
170
Motor Current (Amps)
Values go to "0"
12:00 7/9/96
18:00 7/9/96
0:00 7/10/96
6:00 7/10/96
12:00 7/10/96
18:00 7/10/96
0:00 7/11/96
6:00 7/11/96
12:00 7/11/96
18:00 7/11/96
0:00 7/12/96


Tank 241SY101 - HMR-3 Testing at MASF
Pump Speed - Tag VR232050
Pump Speed (RPM)
1201
1200
1199
1198
1197
Values go to "0"
12:00 7/9/96
18:00 7/9/96
0:00 7/10/96
6:00 7/10/96
12:00 7/10/96
18:00 7/10/96
0:00 7/11/96
6:00 7/11/96
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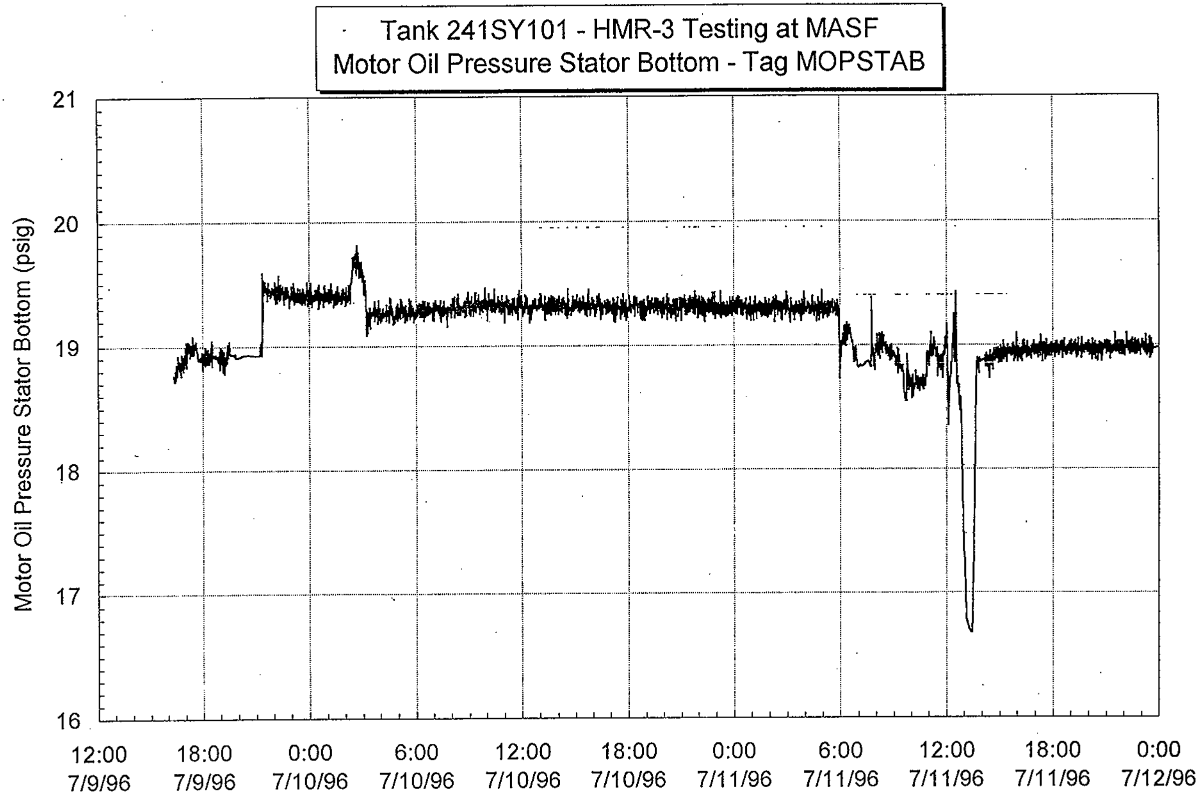
18:00 7/11/96
0:00 7/12/96



Tank 241SY101 - HMR-3 Testing at MASF
Motor Oil Pressure Stator Bottom - Tag MOPSTAB
Motor Oil Pressure Stator Bottom (psig)
21
20
19
18
17
16
12:00 7/9/96
18:00 7/9/96
0:00 7/10/96
6:00 7/10/96
12:00 7/10/96
18:00 7/10/96
0:00 7/11/96
6:00 7/11/96
12:00 7/11/96
18:00 7/11/96
0:00 7/12/96

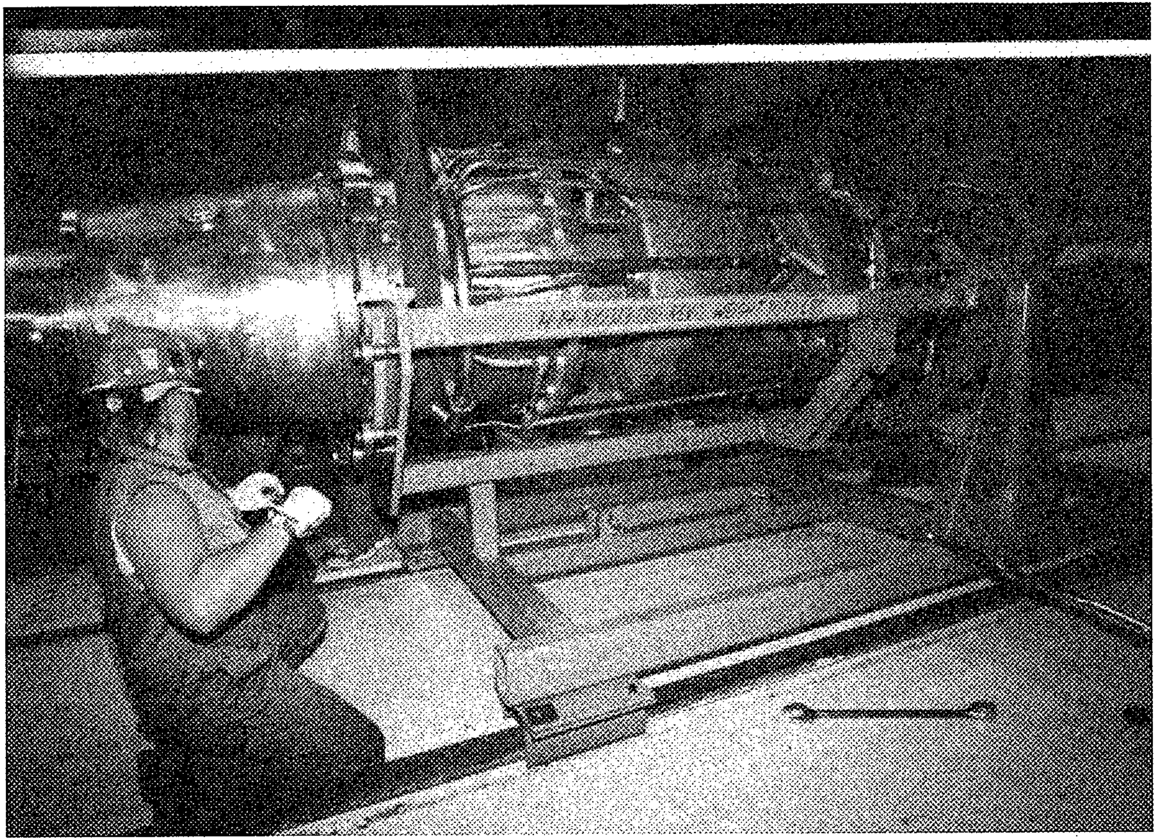


PHOTO #1

HNF ~~WHC~~-SD-FF-EV-003

BOTTOM OF PUMP SITTING IN THE CLAMP AND TILT FIXTURE HORIZONTALLY

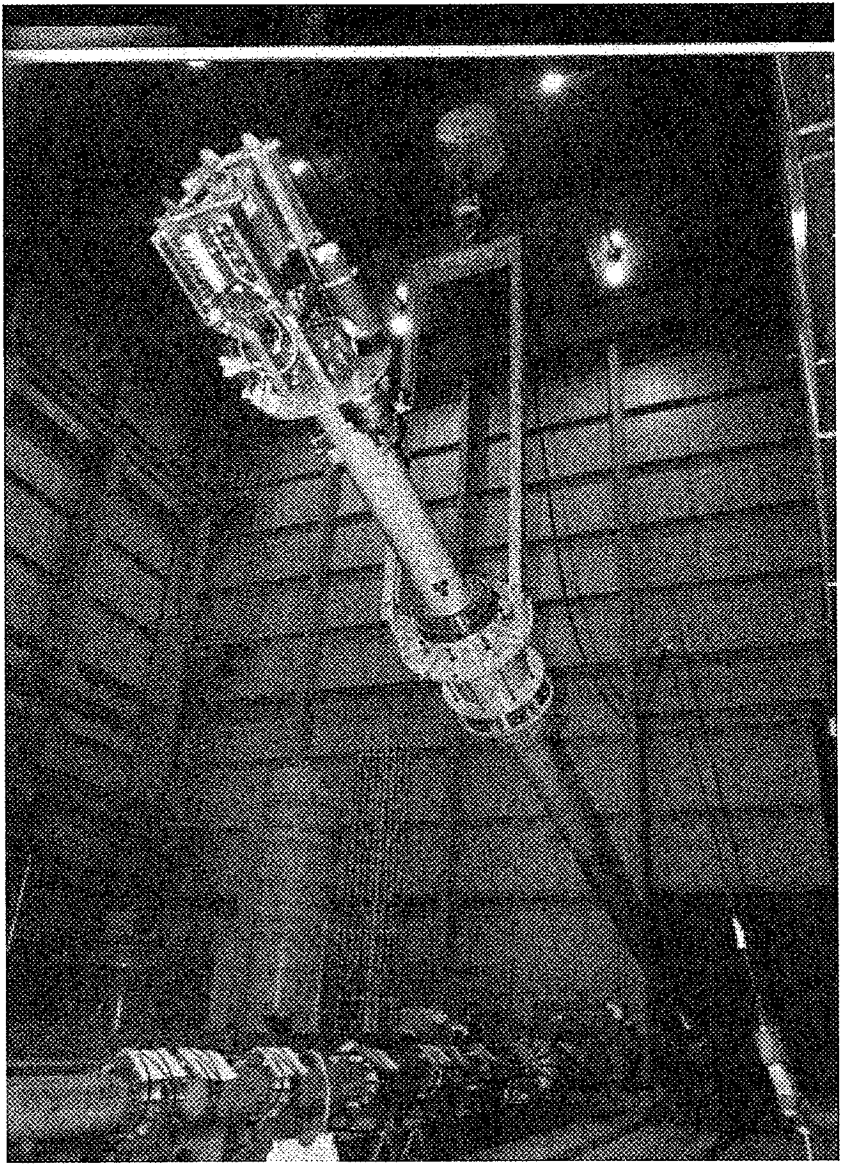


PHOTO #2
HNF ~~WHC~~-SD-FF-EV-003
TRANSFERRING PUMP FROM THE HORIZONTAL TO THE VERTICAL POSITION

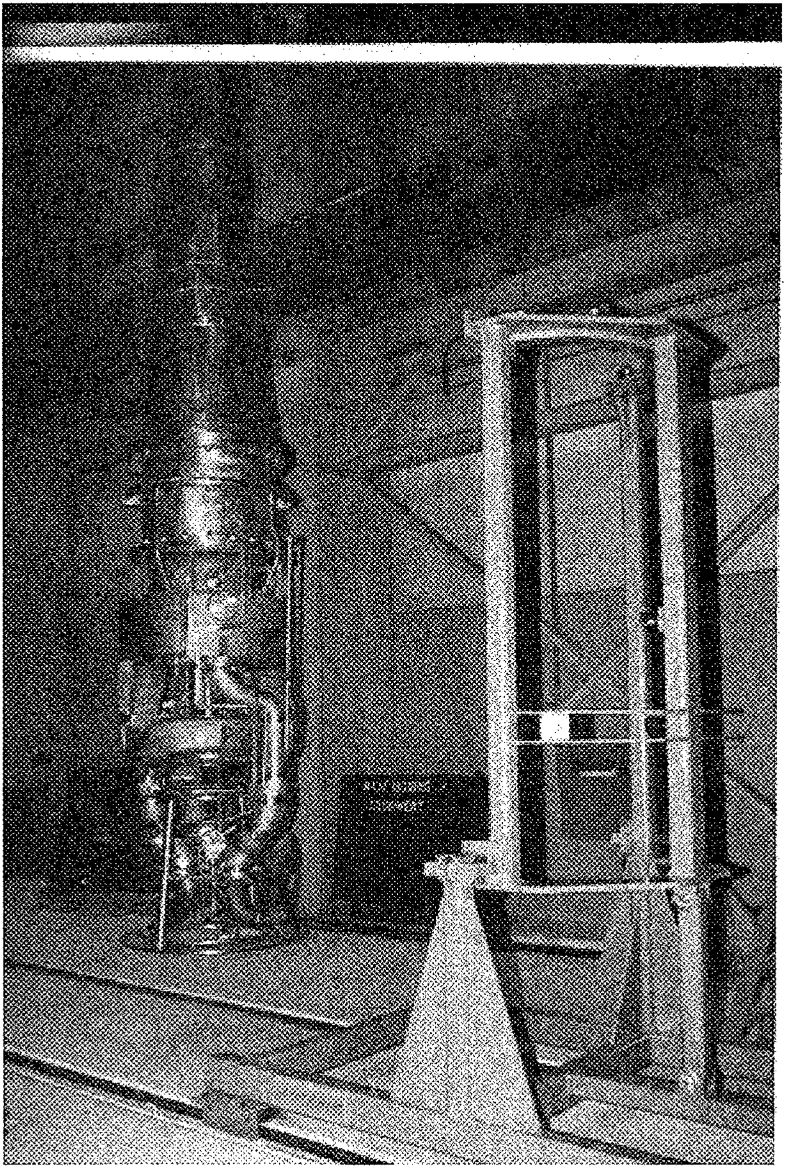


PHOTO #3

HNF ~~WHC~~-SD-FF-EV-003

VERTICAL PUMP REMOVAL FROM THE CLAMP & TILT FIXTURE

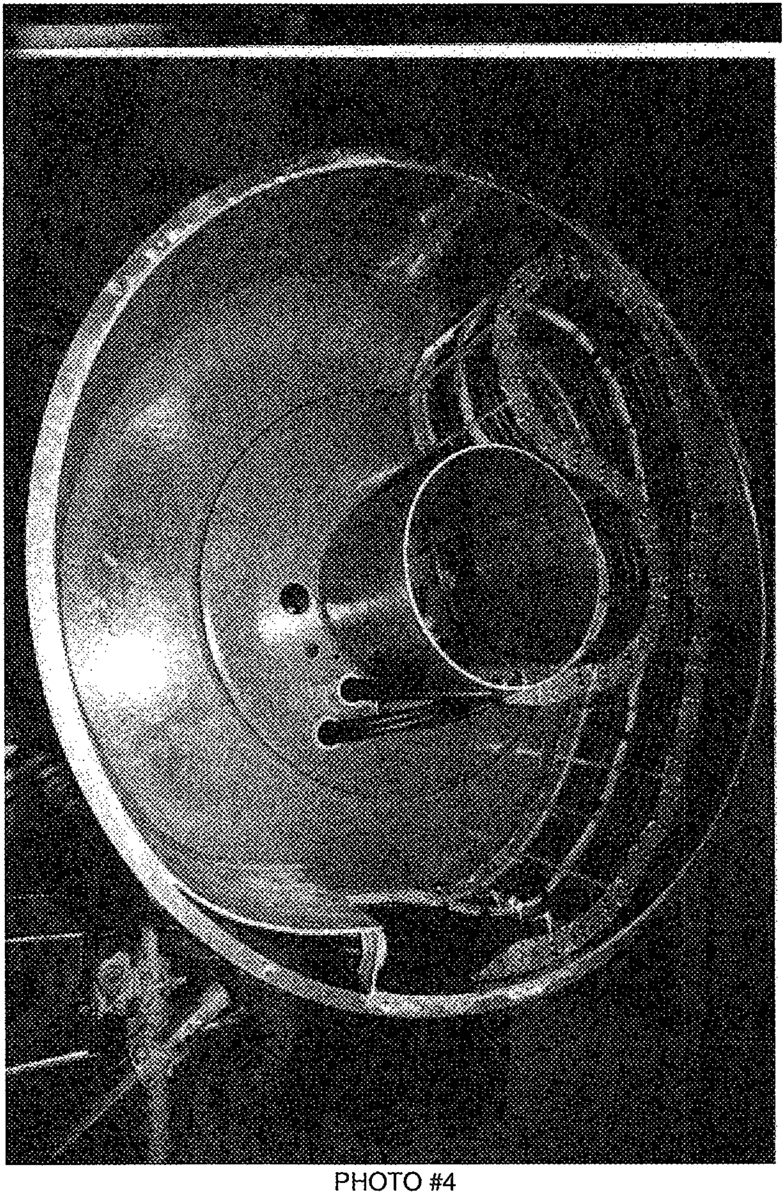


PHOTO #4

HNF ~~WHC~~-SD-FF-EV-003

ENTIRE ELECTRICAL TURNTABLE/POWER TRAK BINDING

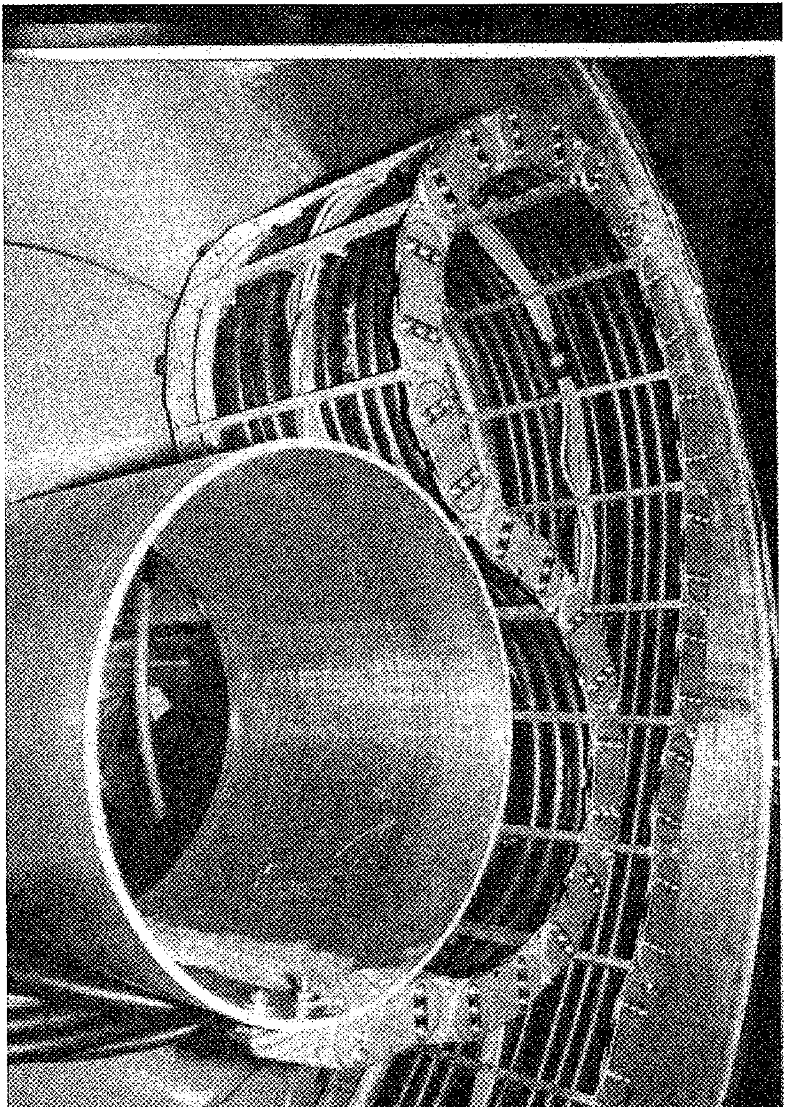


PHOTO #5

HNF ~~WHC~~-SD-FF-EV-003

CLOSEUP OF ELECTRICAL TRUNTABLE/POWER TRAK BINDING

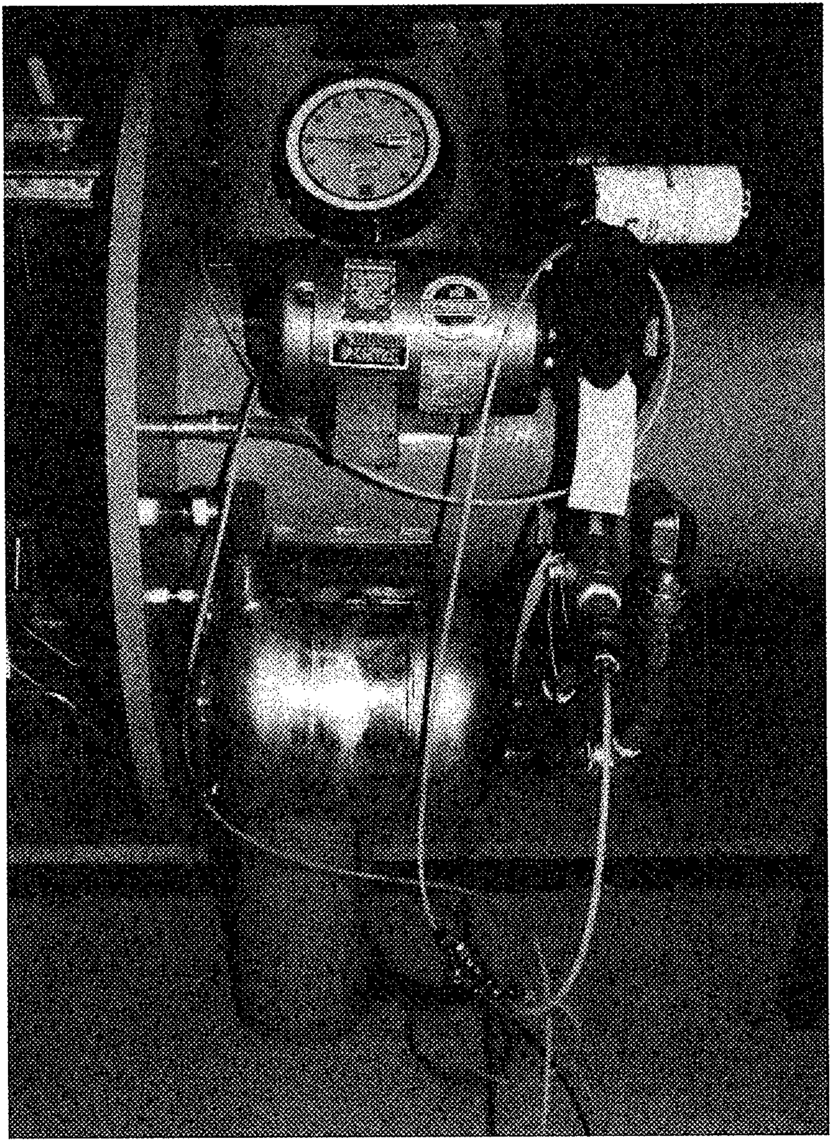


PHOTO #6
HNF ~~WHC~~-SD-FF-EV-003
20 PSIG NITROGEN LEAK TEST ON THE OIL SYSTEM

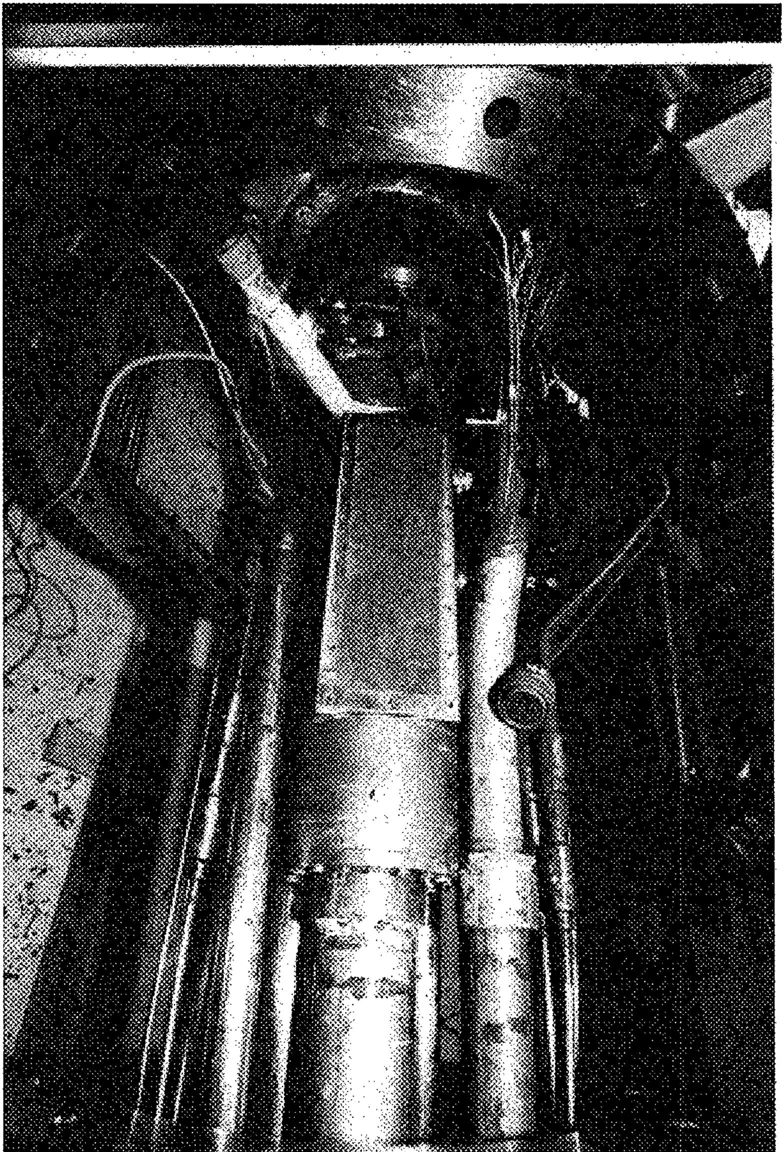


PHOTO #7

HNF ~~WHC~~-SD-FF-EV-003

POTTED NEW TERMINAL BOX ASSEMBLY

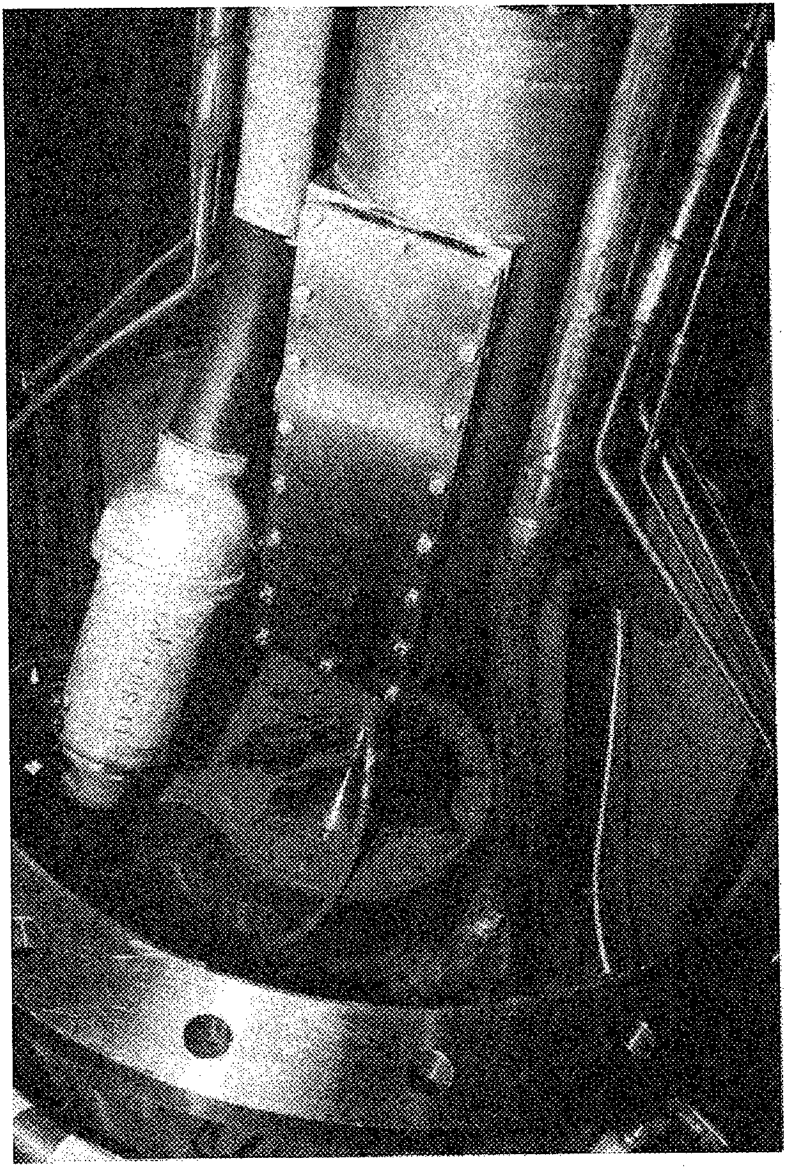


PHOTO #8

HNF ~~WHC~~-SD-FF-EV-003

NEW ELECTRICAL AND INSTRUMENT WIRING TERMINAL BOX ASSEMBLY

DISTRIBUTION SHEET

To	From	Page 1 of 1
Distribution	Equipment Engineering	Date 8/5/97
Project Title/Work Order		EDT No. 617895
Test Report for Run-In Acceptance Testing of HMR Pump-3		ECN No. N/A

Name	MSIN	Text With All Attach.	Text Only	Attach./ Appendix Only	EDT/ECN Only
Babcock & Wilcox					
B. G. Berglin	N2-01	X			
J. R. Vincent	N2-02	X			
Lockheed Martin Hanford Corporation					
W. G. Brown	T4-07	X			
G. J. Gauck	T4-07	X			
R. R. True	T4-07	X			
Lockheed Martin Services					
Document Control	~~G3-11~~	X			
SGN Eurysis Services Corp.					
T. R. Benegas	S7-12	X			
C. P. Shaw	S7-12	X			
Project Files	S7-12	X			