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SUBJECT: Procedure for Performance Test of Turbine Condenser and Associated Equipment--HRT Test V A 2, a, b, c

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Procedure for Performance Test of Turbine Condenser
And Associated Equipment
HRT Test V A 2, a, b, c

1.0 Purpose of the Equipment

The function of the steam surface condenser is twofold. It condenses the exhaust steam from the turbine thus reducing the back pressure on the prime mover and utilizing more of the available heat energy in the steam. It also recovers condensate at high temperatures for re-use in the steam circuit.

2.0 Test Objective

Since all mechanical means for the removal of non-condensable gases from the condenser have been eliminated from the flowsheet, there is some concern whether the condenser will be properly vented for operation at 16 psia. The purpose of the condenser test is to observe the buildup of non-condensibles in the unit, and to observe the ability of the unit to free itself of these gases. Operability and performance of the hot-well pump and liquid level controller will also be established prior to the condenser test.

3.0 Test Procedures

3.1 Hot-well Pump and Liquid Level Controller

The hot-well pump will be tested in a cold water test to facilitate testing independent of turbine generator operation. It is desired to determine the maximum flow to the deaerator which is characteristic of the static water-head of line 348, the pump discharge line. The deaerator will be operated at atmospheric pressure so no additional deaerator head will be present during reactor operation. The liquid level increase in the deaerator will be timed to obtain maximum pump capacity.

3.12 Procedure

- a) _____ Remove 6-in. observation flange on condenser throat and fill hot-well to 24 inches on sightglass.
- b) _____ Set instrument proportional band on 50% and set point on 5.
- c) _____ Open hot-well pump vent to condenser.
- d) _____ Open pump discharge valve, 348B.
- e) _____ Check 20 psig supply to level instrument and control air to valve positioner.

- f) _____ Start hot-well pump and continue to add water to condenser through 6-in. inspection hole. Close hot-well pump vent.
- g) _____ Adjust the water flow going into the condenser so that the liquid level controller has leveled out and the by-pass valve (548) air pressure from the controller is 3 psig. This will indicate that the entire flow entering the condenser is being pumped to the deaerator.
- h) _____ After the system has reached equilibrium the buildup of liquid in the deaerator, as indicated by LI-547, will be timed with a stopwatch.
- i) _____ Check instrument operation by varying flow rate to condenser and by observing control valve action (LCV-548). Adjustments to the proportional band and reset actions of the controller should be made at this time.

3.2 Turbine Condenser Performance

The turbine condenser will be tested independently of turbine generator operation by observing pressure-temperature relationships in the condenser. Steam entering via line 339 will be condensed and pumped to the deaerator surge tank.

Approximately 40 ft³ of air will be present in the condenser before startup providing the unit has not been vented. Should the unit be able to handle this quantity of air during startup, it should function satisfactorily during power operation when the gas produced by radiolytic decomposition in the main steam generators is 0.85 ft³/hr at 5 Mw.

3.21 Procedure

- a) _____ Check cooling water system, Water should be passing through condenser water boxes (FI-517).
- b) _____ Check hot-well liquid level to assure a minimum of 24 inches of condensate is available before startup. Should the level be less than 24 inches, open valve 339A, and kill steam by increasing cooling-water flow.
- c) _____ The hot-well pump should be vented to the condenser and water must be available to the pump shaft seal.
- d) _____ Check instrument air to the following units:
 LI-549, LCV-548, FI-517 and the cooling-water D/P Cell
- e) _____ Check to see that the pressure gauge and thermometer plug has been inserted in the 1-in. tap on the east side of the condenser (see Fig. 3.21-1).

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FIG 3.21-1

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- f) _____ Open valve 339A and allow steam to enter the condenser. Note valve position.
- g) _____ Close hot-well pump vent valve, and start hot-well pump.
- h) _____ Open 1-in. manual vent valve on east side of condenser until a small plume of steam is ejected, indicating that all of the air has been displaced.
- i) _____ Close condenser vent valve and adjust cooling-water flow to yield a pressure of 16 psia. If all of the air has been ejected the temperature should be 216°F.
- j) _____ Record the temperature and pressure and time the buildup of liquid in the deaerator surge tank as indicated by LI-547 on the steam panel.
- k) _____ Shut off valve 339A, noting its position and open condenser vent valve for 15 minutes. The hot-well pump should be shut down during this period.
- l) _____ Close condenser vent valve and set valve 339A at the same position as established in Step (k).
- m) _____ Start hot-well pump.
- n) _____ Check to see that the cooling-water flow is the same as that established during Step (i).
- o) _____ Record condenser pressure and temperature. The overpressure will be due to the 40 ft³ of air trapped in the unit.
- p) _____ Record hot-well pumping rate.
- q) _____ Continue to record pressure, temperature and pump rate every 15 minutes until no condenser overpressure exists. Note overall time required to obtain this condition.

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Turbine Condenser Test Data Sheet

Condenser			Hot-Well Pump Rate (LI-547)			
Pressure	Temperature	Overpressure ^a	% Begin	% End	Time Req'd	GPM ^b

^a Refer to Standard Steam Tables^b Deaerator surge tank calibration curve

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DEAERATOR SURGE TANK
TURBINE CONDENSER TEST
FLWSHEET

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