PURPOSE: Define a procedure for Chloride removal due to condenser tube leak

SCOPE: This SOP is applicable at NTPL

RESPONSIBILITY: Shift Engineer / Operation Engineer

CONDENSER TUBE LEAKAGE

In case of condenser tube puncture, Hot well/CEP is the first place which gets affected. Therefore, in case of any abnormal HW conductivity reading in DCS, the first thing is to take CEP discharge sample for testing conductivity and chloride. If values are considerably higher(Cl>10ppm, Sp.Conductivity>50 µS/cm and Cat. Conductivity>0.4 µS/cm) and is in increasing trend, first step is to stop water and steam circulation in the system, for that following is the procedure to be followed:

PRDS self-source to be isolated and charged from other unit. From the time condenser tube leak is suspected, try to maintain pH>9.5 by injecting sufficient ammonia and hydrazine and opening of CBD and EBD. When leak is confirmed by LAB, UT source to be changed to Station source. In the meantime, reduce the unit load to minimum. After that immediately trip the Boiler. Purge the boiler for 9 mins and Box-Up and Stop ID-FD fans. After purging, stop all BCW pumps and all three BFPs and stop all dozing pumps. Both TDBFPs STG can be stopped and to be rotated 180 deg every 2 hours by hand barring. Close Boiler stop valve(MSV) and HPBP and its spray isolation HOV. Close SH and RH spray isolation rot valve from all BFPs and CEP spray to PRDS isolation. Immediately stop one CEP and stop feeding to Deaerator by closing Dea. Control valve and isolate all LP heaters by closing I/L and O/L MOVs and close all LPHs bypass MOVs. Kill HRH pressure close LPBP and its spray from CEP and open RH vent. Cut the Seal Steam to main turbine and TDBFPs and kill the vacuum. Open RH drains and CRH atm drain. Stop ACW pump and both CW pumps. Open ACW interconnection from other unit to TG-DMCW PHE. After stopping CW pumps, condenser water box to be isolated and drained. FW system, HP heaters, all BFPs, Deaerator and LP heaters to be drained. All Extraction valve to be closed. ACW interconnection line can be used for DMCW cooling system.

- If TG Oil temperature could not be maintained ≈ 50 deg C, cooling water can be drained and fresh water to be entered.
- SG DMCW temperature at PHE o/l to be maintained <50 deg C by draining the DM water

Following three activities, mentioned below, are parallel and are independent of each other.

1.CEP DUMPING AND CONDENSATE FLUSHING

With one CEP, start dumping (CDV 43).

Stop CEP when HW level comes below -700mm and drain Hotwell.

When condenser water box is drained and all condenser water box man hole open, after jacking the condenser, fill Hotwell with CT pump till tube bundles with DM water to locate the tube puncture.

When punctured tube identification gets completed, start one CEP in RC and start dumping the water by CDV 43, 50-60 % open. Take CEP sample. Meanwhile, condenser damaged tube plugging is going on. When Hotwell level falls below -700mm stop CEP and drain Hotwell. Filling(+130mm) and draining of Hotwell with CT pump to be continued in the same manner, taking one by one all CEPs, taking sample every half an hour. When sample reading reduce considerably, start flushing the LP heaters one by one in open drain, isolating the others. Proceed for next LP heater if sample reading comes normal. CEP suction filter drain and all flash tank loop drains to be opened (* this to be normalized once process is complete)

*** Periodic sample to be taken to check chloride(<2ppm) and conductivity(20 µS/cm)**

*** With every flushing Ammonia and Hydrazine to be added with DM water to keep PH>9.5**

2.DEAERATOR AND FW SYSTEM FLUSHING

After stopping all BFPs, both TDBFP STG to be stopped and every 2hours hand barring to be done to rotate 180^{o}. Close all three BFPs suction valve for Deaerator flushing. After that Deaerator to be drained through Unit flash tank. Fill the Deaerator by fill pump up to +700 mm and drain through Unit flash tank**.** Every time before draining any system, take sample for testing chloride and conductivity **(required values Cl<2ppm and conductivity <20 µS/cm).**

Filling and draining of Deaerator to be continued by Fill pump till sample readings come under limit. From Dea 2nd filling onwards MDBFP to be started in RC atleast for 20 mins, then draining after taking sample.

Once normal value is obtained in Deaerator, both TDBGP flushing to be done after putting it into STG atleast for 20 mins keeping RC and drain open.

Charge FW system, HP heaters.

Flushing with MDBFP in service from De-aerator to Feed control station through HP heaters, keeping the Economiser inlet valve(E2) in closed condition and the drain valve(E20) to IBD in open condition and process to be continued till required values come i.e. CL<2ppm and conductivity<**20 µS/cm**

*Take HP heaters sample for testing chloride and conductivity

*** With every flushing Ammonia and Hydrazine to be added with DM water to keep PH>9.5**

3.DRUM AND SH BACK FLUSHING

After 4 hours of the boiler trip, start One ID-FD series for force cooling with an air flow of 300-400 TPH, keeping DMT ΔT<50 ^{o}C always. Boiler contour to be Hot drained at drum pressure 5 ksc and force cooling to be continued till DMT<70^{o}C. After draining when DMT<70, stop all Fans. After that it is to be filled up to +300mm drum level by Fill pump atleast twice and draining after taking CBD sample for testing chloride and conductivity. ALL BCWs cavity water to be flushed and filled with DM water after testing from casing drain. In 2nd filling one by one run all BCW pumps atleast for 15-20 mins.

3rd time boiler to be filled through SH and back-washing to be done keeping boiler stop valve(MSV) in closed condition, by closing bottom ring header drain and ECO drains and filling through SH Header drain. Filling to be confirmed by overflow through all the SH vents (LTSH, DIV, PLATEN) and drum up to +350mm level after that stop fill pump. Whole system to be drained after taking samples (MS, SS, CBD).

*** With every flushing Ammonia and Hydrazine to be added with DM water to keep PH>9.5**

When Chloride value comes <10ppm, start hot chloride flushing. Fill the drum up to working level with MDFFP with FW flow of 50-100 TPH(* Deaerator to be filled by fill pump). Light-up the boiler with 2 LDO oil burner with controlled firing and raise BCW suction manifold temperature up to 90 deg.C keeping Boiler stop valve closed. Then cut-out all oil burner and take CBD sample and drain the boiler contour.

[in case chloride and conductivity values are not reducing and still more than the required values, fresh cold water flushing to be continued till required values come i.e. **Cl<2ppm and conductivity< 20 µS/cm**]

*Condenser jacking to be normalised before starting CW.

*when Condenser damaged tube plugging LC return, charge the system and start CW pump and ACW pump. Close ACW interconnection from other unit, to TG-PHE.

Fill the drum by MDBFP (Dea. By fill pump) with FW flow of 50-100 TPH. Again light-up the boiler with 2 LDO guns. Keep oil guns in service and every 1 hour take CBD/SS/MS/FW sample. After Drum pressure of 15 Ksc, every 15 mins open bottom ring header drain B96-B97 for 1 min for draining. **Repeat the process till chloride comes <2ppm and conductivity <20 µS/cm.**

Once values come under the limit, Pull the vacuum and commission HP-LP bypass at 15-20 ksc for steam dumping-open cycle. Every hour samples have to be checked CEP, FW, SS, MS, CBD. Keep on dumping and flushing unless desired value comes **Cl<2ppm and conductivity< 20 µS/cm**.

Following points to be followed:

1. CEP dumping to be continued till HW chloride and conductivity comes to required value. Till then **Deaerator to be filled with Fill pump not from CEP**

2. After final leak check also, the HW should have been drained completely.
3. After normalizing the condenser and turbine STG, pull vacuum and keep dumping CEP till the values become normal for further clearance to light up. since there is possibility of locked up contamination in flash tanks, tdbfp, etc...
4. CPU to be taken into service while sending the water to deaerator.
5. Drum pressure should not be raised >20 ksc till the normalisation of system chemical parameters.
6. Periodic sample (every hour) to be taken while increasing drum pressure.
7. Dosing may be introduced in the system while increasing pressure.
8. **Criteria for system normalisation is all sample, Cl<2 ppm and conductivity <20µS/cm**
9. **With every flushing Ammonia and Hydrazine to be added with DM water to keep PH>9.5**

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