



NLC TAMILNADU POWER LIMITED
DEPARTMENTAL PROCEDURE MANUAL
STANDARD OPERATING PROCEDURE

TITLE:- SOP FOR Boiler Acid Cleaning

Doc. ID: NTPL/OPRN/SOP-15

PURPOSE: Define a procedure for Boiler Acid Cleaning

SCOPE: This SOP is applicable at NTPL

RESPONSIBILITY: Shift Engineer / Operation Engineer

PRELIMINARY ARRANGEMENTS AND RESPONSIBILITIES

S NO	PROCESS	PRELIMINARY ARRANGEMENTS	SCOPE
1	READINESS OF THE SYSTEM	1. CONNECTION OF BOILER FILLING LINE NEAR DRAIN HEADER	BM
		2. CONNECTION OF HOT DM WATER LINES TO	
	KEEP ONE BOILER FILL PUMP IN EMERGENCY SUPPLY BUS TO ENSURE CC PUMP PRURGING IN CASE OF SUPPLY FAILURE	a.ECO INLET @ DRAIN HEADER	
		b.Bottom RING HEADER and BCW PUMP SUCTION MANIFOLD	
		c.SH FILLING LINE	
		d.HP LINE CONNECTION	
		3. DEAERATOR DRAIN LINE TO MIXING TANK CONNECTION(HOT DM WATER)	
		4. FILL PUMP (COLD DM WATER) CONNECTION TO MIXING TANK, SINTEX TANK	
		5. DRAIN LINE	
		6. SAMPLE POINTS FOR BCW SUCTION AND BOTTOM RING HEADER	
		7. CUTTING SAMPLE PIECE FROM BOILER FOR SAMPLE COUPON	



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		8. SAMPLE COUPON AT DRUM AND BOTTOM RING HEADER	
	VOLUME	9. DUMMY TO BE PROVIDED IN RH FILLING LINE AT 0 ML	
	GENERATING SURFACES- 160M3 DRUM-60M3 ECONOMISER- 135M3 SH(DRUM TO SHO OUTLET HEADER)- 145M3	10. ATTENDING LEAKS IN DRAIN HEADER ie. DRAIN VALVES AT 0 ML AND 27ML, CBD GLAND LEAK AT 74 ML AND BCWP CC PUMP CASING DRAIN GLAND LEAK	
		11. READINESS OF LOCAL DRUM GUAGE GLASS(L&R)	
		12. ECO R/C NRV FLAP REMOVAL	
		13. ISOLATION OF DRUM CONNECTIONS & ONE DRUM PRESSURE T _{xr} AND ONE LEVEL T _{xr} READINESS ISOLATION OF ECONOMISER CONNECTION	C&I
	TOTAL-500M3	14. READINESS OF GUARD POND/ RC PUMP PROVISION	CIVIL AND CHEMICAL
		15. EMERGENCY SUPPLY FOR BOILER FILL PUMP	ELECTRICAL
		16. POWER SUPPLY FOR THE EQUIPMENTS AND LIGHTING ARRANGEMENTS	ELECTRICAL
		17 SHOWER ARRANGEMENTS NEAR ACID TANK	CIVIL
		18. PRDS STEAM TAPPING POINT FROM NEARBY MILL INERT LINE TO MIXING TANK CONNECTION	BM



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ACTIVITY

SL NO	DURATION	PROCESS	ACTIVITIES
1			BEFORE STARTING THE PROCESS, CORROSION RATE TEST TO BE CONDUCTED
2	1 HOUR	FLUSHING AND HYDROTEST	ENSURING HEALTHINESS OF THE SYSTEM AT 15 KSC PRESSURE
3	6HRS	SH FILLING AND BACK FLUSHING (VOLUME 145 M3) CONSUMPTION: HYDRAZINE-AMMONIA-	DM WATER ABOUT 200 M3 THROUGH MIXING TANK
			HYDRAZINE-(200PPM) AMMONIA-(PH>10) TO BE MIXED IN THE TANK
			BACK FLUSH SH WITH TREATED DM WATER. WHEN WATER START COMING THROUGH WATER WALL HEADER DRAIN STOP FILLING
4	3 HRS + 4 HRS	COLD WATER RINSE-1	DM WATER ABOUT 400 M3
			FILLING UP TO DRUM LEVEL 4 BOLTS THROUGH RING HDR DRAIN, ECO DRAIN AND BCW SUCTION MANIFOLD MIXING TANK
			DO NOT RUN THE BCW PUMP
			DRAIN THE SYSTEM TO LOCAL DRAIN / GUARD POND - ATTENDING ANY REPAIR WORKS
5	3 HRS + 4HRS	COLD WATER RINSE-2	DM WATER ABOUT 400 M3
			FILLING UP TO DRUM LEVEL 4 BOLTS THROUGH RING HDR DRAIN, ECO DRAIN AND BCW SUCTION MANIFOLD MIXING TANK
			START BCW PUMP (MIDDLE) AND RUN FOR 30 MIN
			AFTER STARTING BCW AND WHILE DRAINING THE SYSTEM, TAKE ONE-ONE SAMPLE FROM BCW SUCTION AND BOTTOM RING HEADER AS WELL FOR TESTING pH, CONDUCTIVITY AND TURBIDITY
			DRAIN THE SYSTEM TO LOCAL DRAIN / GUARD POND



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6	5 HRS	HOT WATER RINSE	DURING DRAINING OF BOILER CONTOUR AFTER COLD WATER RINSE, HEAT DM WATER TO 90°C IN DEAERATOR (DEAERATOR HEATING TO BE STARTED DURING COLD WATER RINSE 2)
			HOT DM WATER 180M3 FROM DEAERATOR + COLD DM WATER HEATING AT MIXING TANK WITH AUX STEAM TO FILL THE COUNTER APPROX 55-60°C UP TO DRUM LEVEL
			ALL FILLING THROUGH MIXING TANK
			RUN BCW PUMP (MIDDLE) FOR 30 MIN
			AFTER STRATING BCW AND WHILE DRAINING THE SYSTEM, TAKE ONE-ONE SAMPLE FROM BCW SUCTION AND BOTTOM RING HEADER, FOR TESTING pH, CONDUCTIVITY AND TURBIDITY
			DRAIN TO LOCAL DRAIN/GUARD POND
6A	6 HRS	ACID PICKLING PREPARATION	A. WHILE DRAINING IN 4th STEP, START ACID PREPARATION
			FILL DEAERATOR AND HEAT UP TO 90°C FOR FILLING CONTOUR
			HOT DM + COLD DM FOR FILLING BOILER UP TO DRUM LEVEL 2 BOLTS
			WITH 200PPM HYDRAZINE AND AMMONIA PH-10.0.BACK FILL SH WITH SH BACK FILLING PUMP TILL DRUM LEVEL COMES TO OPERATING LEVEL(4-5 BOLTS)
			BCW PUMP (MIDDLE) IN SERVICE
			LIGHT UP BOILER WITH 4 HFO TO ACHIEVE METAL TEMP AT DRUM & SUCTION MANIFOLD 80°C
			ONCE TEMP REACHED SHUT DOWN THE BOILER AND PURGE THE FURANCE STOP ALL FANS CLOSE I/L AND O/L FOR ALL FANS AND CLOSE ALL FURNACE OPENINGS. DRAIN THE SYSTEM
			B. FILL DEAERATOR AND HEAT UP TO 90°C FOR FILLING CONTOUR
			MIX 30-32% HCL, INHIBITOR, AMMONIA BIFLURIDE AND THROUGHLY IN ACID MIXING TANK AND RECIRULATION FOR 1HR.



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6B	8HRS	ACID PICKLING (STAGE-1) CHEMICAL CONSUMED 1. HCL 2. INHIBITOR 3.	KEEP ENTIRE BLOW DOWN VALVES SHUT AND DRUM VENTS OPEN TO FACILITATE ESCAPE OF GASES
			READINESS OF N2 CAPPING SYSTEM PRIOR TO FILLING
			CLOSE THE VALVES TO GUARD POND DRAIN & DRUM VENTS OPEN CONDITION
			PURGE WATER TO BCW PUMP (MIDDLE)S FROM BOILER FILL PUMP TO BE MADE READY
			START FILLING HOT DM WATER ,TEMP RESTRICTED TO 65-70°C, THROUGH SUCTION MANIFOLD HEADER OF BCW PUMP (MIDDLE), ECO, BOTTOM RING HEADER.
			SIMULTANEOUSLY START INJECTING ACID ALONG WITH FILL WATER(4 BOLTS)
			MAINTAIN ACID CONCENTRATION OF 5%+1% IN THE BOILER WATER
			MAINTAIN CONC. BY TAKING SAMPLES FROM BCW PUMP (MIDDLE) & SUITABLY ADJUST THE CHEMICAL INJECTION CONTROL VALVES
			CLOSE THE BCW SUCTION HEADER FILLING WHEN DRUM LEVEL IS VISIBLE AND CONTINUE FILLING THROUGH ECO & BOTTOM RING HEADER TILL DRUM LEVEL COMES 100MM ABOVE CENTRE LINE. DO NOT PERMIT THE LEVEL TO GO OUT OF GAUGE GLASS.
			ONCE FILLING COMPLETES, RUN THE BCW PUMP (MIDDLE) FOR 30MIN
			30 mins AFTER STARTING BCW PUMP, TAKE SAMPLE FROM BCW SUCTION AND BOTOM RING HEADER EVERY 30 mins AND ANALYSE ACID STRENGTH & IRON CONC AND TEMPERATURE
			STOP BCW PUMP (MIDDLE) AFTER 30 MIN. AND ALLOW TO SOAK
			OPERATE BCW PUMP (MIDDLE) FOR 5 MIN AT AN INTERVAL OF 30MIN
			ANALYSE ACID & IRON CONC. ACID SOAKING PROCESS IS TO BE CONTINUED TILL IRON CONC. IN 3 CONSECUTIVE SAMPLES SHOW EQUILIBRIUM OR 8 HRS(INCLUDING FILLING AND DRAINING) WHICH EVER IS EARLIER.
			PRIOR DRAINING OPERATE BCW PUMP (MIDDLE)S FOR 5 MIN



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			DURING DRAINING MAINTAIN N2 CAPPING 2-3KSC
			FILL DEAERATOR AND HEAT UP O 90°C FOR FILLING CONTOUR WHILE DRAINING IN PROGRESS ie. STEP5
			FILLING DRUM THROUGH ECO,WW, WITH HOT DM+ COLD DM AT 50-60°C UP TO VISIBLE LEVEL(3-4 BOLTS)
7	5 HRS	DM RINSE	FURTHER RAISE THE DRUM LEVEL BY +100mm WITH BACK FILL SH USING TREATED WATER(HYDRAZINE + AMMONIA)
			N2 CAPPING 2-3 KSC
			BCW PUMP (MIDDLE) FOR 10MIN EVERY HALF AN HOUR TILL UNIFORM CONCENTRATION ARE ATTAINED
			ANALYSE FOR UNIFORM CONC. OF RESIDUAL ACID AND IRON CONC. EVERY HOUR FROM BCW SUCTION AND BOTTOM RING HEADER
			DRAIN WITH N2 CAPPING 2-3 KSC PRESSURE
			WHILE DRAINING IN 6th STEP, START ACID PREPARATION. AFTER THAT REPEAT STEP 5B. CHEMICALS COMUSED TO BE RECORDED
			REPEAT 6
8	8 HRS	ACID PICKLING STAGE-II	DM TEMP TO 50-55°C
9	5 HRS	DM RINSE	BCW PUMP (MIDDLE) FOR 20MIN.
			AFTER STRATING BCW AND WHILE DRAINING THE SYSTEM, TAKE ONE-ONE SAMPLE FROM BCW SUCTION AND BOTTOM RING HEADER AS WELL FOR TESTING ACID% AND TOTAL IRON PPM
			ANALYSE SAMPLE FOR IRON AND DRAIN THE BOIELR UNDER NITROGEN CAPPING
			FILL DEAERATOR AND HEAT UP TO 90°C FOR FILLING CONTOUR WHILE DRAINING IN PROGRESS ie. STEP8
			FILL DRUM LEVEL WITH HOT DM + COLD DM 50-55°C SIMULTANEOUSLY INJECT CITRIC ACID + AMMOINA PH 3.5-4.0.FILL DRUM UP TO CENTRE VIEW GLASS



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10	6 HRS	CITRIC ACID CHEMICAL CONSUMED 1. CITRIC ACID 2. AMMONIA	BCW PUMP (MIDDLE) CIRCULATION FOR 2HRS.
			AFTER STARTING BCW PUMP TAKE SAMPLE FROM BCW SUCTION AND BOTTOM RING HEADER EVERY HOUR AND ONE SAMPLE WHILE DRAINING AND ANALYSE PH & IRON CONC.
			DRAIN THE CONTOUR WITH N2 CAPPING
			FILL DEAERATOR AND HEAT UP O 90°C FOR FILLING CONTOUR WHILE DRAINING IN PROGRESS ie. STEP9
			FILL DRUM LEVEL WITH HOT DM + COLD DM 50-55°C
11	5 HRS	DM WATER RINSE-I	OPERATE DRUM VENTS TO MAINTAIN N2 PRESSURE OF 0.5KSC.
			FILL DRUM UP TO CENTRE VIEW GLASS FURTHER RAISE 100MM BY BACK FILL SH WITH TREATED WATER
			BCW PUMP (MIDDLE) FOR 20MIN. ANALYSE SAMPLE FROM BCW SUCTION AND BOTTOM RING HEADER FOR PH & IRON CONC.
			DRAIN WITH N2 CAPPING
			FILL DEAERATOR AND HEAT UP O 90°C FOR FILLING CONTOUR WHILE DRAINING IN PROGRESS ie. STEP9
12	5 HRS	DM WATER RINSE-II	FILL DRUM LEVEL WITH HOT DM + COLD DM 50-55°C
			OPERATE DRUM VENTS TO MAINTAIN N2 PRESSURE OF 0.5KSC.
			FILL DRUM UP TO CENTRE VIEW GLASS FURTHER RAISE 100MM BY BACK FILL SH WITH TREATED WATER
			BCW PUMP (MIDDLE) FOR 20MIN. ANALYSE SAMPLE FROM BCW SUCTION AND BOTTOM RING HEADER FOR PH & IRON CONC.
			DRAIN WITH N2 CAPPING
			PREPARE NEUTRALIZING SOLUTION BY ADDING DI SODIUM PHOSPAHTE HPTA HYDRATE AND TRI SODIUM PHOSPHATE DO-DECTA HYDRATE TO GET CONC. OF 0.1% TO 0.2% IN BOILER
			START DRUM FILLIING AS PER STEP 5 AND 7 WITH SIMULTANEOUS INJECTION OF PHOSPHATE SOLUTION



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13	30 HRS	NEUTRALISATION CHEMICAL CONSUMED 1. TSP 2. DSP	OPEN DRUM VENTS
			ONCE BOILER COMPLETE, START BCW PUMP (MIDDLE)
			30 mins AFTER STARTING BCW PUMP TAKE SAMPLE FROM BCW SUCTION AND BOTTOM RING HEADER FOR TESTING PH
			LIGHT UP THE BOILER
			RAISE THE DRUM PRESSURE TO 10KSC WITH 4 HFO GUNS
			HOLD THE PRESSURE AT 10KSC FOR 6HRS AND START TAKING SAMPLE EVERY HOUR FROM BCW SUCTION AND BOTTOM RING HEADER FOR TESTING PH
			AFTER 6 HRS KILL THE FIRE, PURGE THE BOILER, OPEN ID FAN O/L GATES & OPEN ONE FD FAN I/L GATE
			NATURAL COOLING TO BE DONE
			SHUT DOWN THE PUMPS WHEN THE METAL TEMP COMES BELOW 90°C AND DRAIN THE SYSTEM
			JUST BEFORE DRAINING BACK FLUSH SH WITH DM WATER CONDITIONED WITH HYDRAZINE(>200PPM) AND pH >10
			AFTER THIS DRAIN THE SYSTEM
			ALLOW THE SYSTEM TO AERATE. PREPARE FOR PASSIVATION
			PREPARE A BLENDED SOLUTION OF HYDRAZINE AND AMMONIA IN ORDER TO ACHIEVE MIN. AMOUNT OF 250PPM OF HYDRAZINE AND AMMONIA PH-10
14	48 HRS	PASSIVATION	FILL THE BOILER WITH SIMULTANEOUS INJECTION OF CHEMICAL SOLUTION
			START BCW PUMP (MIDDLE)
			LIGHT UP THE BOILER
			RAISE DRUM PRESSURE TO 10KSC.
			START TAKING SAMPLE EVERY HOUR FROM BCW SUCTION AND BOTTOM RING HEADER FOR TESTING PH AND HYDRAZINE AND AMOUNT MAINTAIN HYDRAZINE (>200PPM) AND



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	CHEMICAL CONSUMED 1. HYDAZINE 2. AMMONIA	AMMONIA(PH>10) CONTENT. HOLD THE DRUM PRESSURE FOR 24HRS
		DURING THIS PROCESS HYDRAZINE AND AMMONIA MAY BE FILLED IN PHOSPHATE DOSING TANK AND MAY BE FEED TO DRUM ALONG WITH MIXING TANK
		STOP THE BOILER,PURGE THE BOILER, OPEN ID FAN O/L GATES & OPEN ONE FD FAN I/L GATES
		PURGE THE BOILER ALLOW IT FOR NATURAL COOLING
		SHUT DOWN THE PUMPS WHEN THE METAL TEMP COMES BELOW 90°C
		DRAIN THE SYSTEM
		AERATION DURATION AFTER DRAINING NEARLY 2-3 HOURS
CHEMICAL CLEANING PROCESS COMPLETE		

Date:	PREPARED BY	REVIWED BY	VERIFIED BY	APPROVED BY
Rev no. 00				
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