Bangladesh Power Development Board

INTEGRATED MANAGEMENT SYSTEM
(BASED ON ISO 9001:2015, ISO 14001:2015 & ISO 45001:2018 STANDARDS)

PROCEDURE FOR OPERATION AND CONTROL OF AUXILIARY SYSTEMS-COAL POWER PLANT

1.0 Purpose

a) To determine and plan its processes and define the functions that are necessary for providing generation of electric power that can continue to meet the needs and expectations of customers
b) To plan and control in accordance with the organization's strategy
c) To run the processes under controlled conditions
d) To monitor, measure and review activities,
e) To ensure a method for safe and quality auxiliary operation.

2.0 Scope

Applies to all Coal power plant of Integrated Management System of Bangladesh Power Development Board (BPDB).

3.0 Terms and Definition

Definition

None

Abbreviations

BPDB- Bangladesh Power development Board
MR – Management representative

4.0 Roles and Responsibility

None

5.0 Procedure

5.1 Plan of the operational procedures

5.1.1 Auxiliary processes consist of followings:

a) Lube oil system for R.A.H
b) FDF, IDF, PAF lube oil
c) Air heater
d) Oil convey system
e) Fuel will pump
f) Wind box/furnace differential control warming
g) IDF & FDF
h) Purging
i) Oil Gun system
j) Soot Blower
k) Boiler prestart Auxiliaries
l) Vacuum Drawing
m) Feed Water & pipe
n) Rotor turning with steam

5.2 Lube oil system for R.A.H

Click boiler menu click boiler air heater oil

1. First time give electricity for all pumps.
2. Then air heater support and guide cooling system open.
3. Then air heater A & B guide and support lube oil pump start.
    - When temperature -65°C then auto starts and when temperature +52°C then auto stop the Support lube oil pump.
    - When temperature -70°C then auto starts and when temperature +52°C then auto stop the Guide lube oil pump.
4. Then AUX and Main motor lube oil pump start.

5.3 FDF, IDF, PAF lube oil system:

Click boiler menu and click FDF-A, B, IDF-A, B, PAF-A, B

1) First time give electricity for all.
2) Then give electricity for heater.
3) Then heaters open (STAN BY) ok.
4) When lube oil temperature 25°C then start pump any one and the rest on will be in STAN BY condition.
5) After 30 min (approximately) when level of ** FDF-A, B, IDF-A, B, PAF-A, B all these pumps/fans lube oil system are same**.**

5.4 Start-up air heater:

Click boiler menu and click boiler flue gas.

1) First time AUX Motor start-up and after 1 min. start-up main motor.
2) This time AUX and Main Motor running.
3) After 20 min. stop the AUX Motor.
4) Then air heater running.
5) Then air heater inlet & outlet damper close. Scan fan start-up:
    a. Start scan fan.
    b. One fan running and another will be STAND

5.5 Oil convey system checking:

Click boiler menu and then click IGN OIL SYSTEM and CAP.

1) First time fuel oil header trip valve open.
2) Then fuel oil pressure control valve 30% open (But Handle valve close).
3) Then fuel oil recirculation valve close (But Handle valve/Bypass valve some open).
4) At that time oil purging and atomizing valve must be all closed condition.

5.6 Fuel oil pump start-up:

Click boiler menu and fuel oil pump.

1) When checking finished then start fuel oil supply pump.

2) Then fuel oil supply control valve open (Auto mode, S.P-2MPa).
3) Fuel oil pressure control valve open (Auto mode, S.P-1.5MPa).

5.7 Wind box/furnace differential control system start-up:

Click boiler menu and air DMPR CTRL STA

1) Fuel oil damper all close
2) AUX air damper AA 30% opens (AA1, AA2, AA3, and AA4 all 30% open).
3) But AUX air damper AB, BC, CD, DD all close.

5.8 IDF & FDF

5.8.1 Start-up IDF:

Click boiler menu and boiler flue gas.

1) Then start IDF-A or IDF-B (Air flow may be -1200Nm^3/h).
2) IDF outlet damper automatically open but inlet valve or control valve will be closed at that time

5.8.2 Start-up FDF:

Click boiler menu and boiler flue gas.

1) Then start FDF-A.
2) Outlet damper automatically open.
3) Inlet valve/control valve open 5%.
4) Then start FDF-B
5) Outlet damper will open automatically and inlet valve will some open.

5.8.3 FDF & IDF Adjust:

Click boiler menu and boiler flue gas.

1) When pressure positive then open IDF inlet valve/control valve.
2) Then some open FDF inlet valve and some open IDF inlet valve.
3) And adjust IDF & FDF inlet valve for air flow 1, 30,000 Nm3/h.
4) Air flow need 1. 30,000 Nm3/h for purging (Full load TAF-3, 90,000). When load 125MW then TAF 1, 30,000 Nm3/h, Purging time=3, 90,000 X 1/3 Nm3/h. =1, 30,000 Nm3/h. (Adjusting time furnace pressure -20 to -50)

5.9 Purging Start-Up:

Click boiler menu and BLR IGN SYSTEM & CAP

1) When IDF and PDF adjusting completed then we are ready to do purging.
2) No MFT condition

3) PDF/IDF pair closed
4) Boiler total air flow >30%.
5) AUX air damper ok to purging.
6) Both air heaters closed.
7) Unit no flame.
8) Both PAF open.
9) Fuel oil header trip value closed.
10) All mill opened.
11) All feeders opened.
12) All mill hot air gates closed.
13) All mill temper air gate closed.
14) All mill outlet dampers closed.
15) When this permissible completed then it is ready to purge.
16) Purging time 5 min. (count down started from 300 to 000).
17) Then purging completed.

5.10 Leak test:

- Click boiler menu and click BLR IGN SYSTEM & CAP (purge completed).
- Running plant has no leak test for this reason we bypass this test.
  1) Click Bypass LT then bypass click and then leak lest completed.

5.11 Oil Gum

5.11.1 Checking For Oil Gun Fire:

Click boiler menu and click BLR IGN SYSTEM & CAP and TURB AUX STEAM.

1) Check AUX SYSTEM for oil atomizing.
2) Before fire atomizing temperature > 190°
3) Before fire atomizing steam pressure 0.75MPa.
4) Fuel oil header trip value open position.

5.11.2 Ready to Start-Up Oil Gun "AB":

Click boiler menu and oil AB.

1) When atomizing temperature and pressure ok then we come to "OIL AB page"
2) First time we checking every corner all shut valve for ok condition.
3) Checking oil gun of the furnace.
4) Checking energize ok and click "YES".
5) Checking igniter.

6) When all valves, oil guns, igniters and all Things work properly then we start oil gun.
7) First time start click then AB oil gun ready to AUTO start.
8) Then corner-1 start click and it will AUTO start and fire this corner.
9) After 30 min. corner-3 start to fire in the same way.
10) Corner AB-1 and corner AB-3 fire together for 2. 30 hours.
11) That time boiler steam temperature and pressure ok for turbine rolling.
12) If we don't get sufficient temperature and pressure then we burn another oil gun (Suppose AB-2 or AB-4).(30 to 40 min. turbine rolling)
13) Before synchronizing total four nos. oil gun must be in service.

5.12 Soot Blower:

1. Low Temperature Super Heater metal temperature-570°C (Maximum).
2. Low Temperature Super Heater metal
3. 3) Rear Platen Super Heater metal temperature-570° (Maximum).
4. Front Platen Super Heater metal temperature=570° (Maximum).
5. Finishing Super Heater metal temperature=610° (Maximum).
6. Air Heater Soot Blower operation should be done in every shift.

5.12.1 Soot Blower Operation (Automatic):

1) First time click ENTER
2) Then this Menu comes:

HPH System, oil purification system, deaerator, feed water pump & CWP,OCCWP,CCCWP etc.

- Are examined to be normal in accordance with the operation regulations for auxiliary equipment.

5.13 Boiler pre-starting Auxiliaries

5.13.1 LP auxiliaries:

CP, Chilled water pumps. drainage pumps. OCCWP. CCCWP, governor oil pumps, AC/DC lubricating oil pumps. OP. are trial run & tested for coordinated operation to be normal protection for coordinated operation of HPH is normal. Start heater air extractor is tested to be normal.

5.13.2 Carry out turbine:

I) Start AC lubricating oil pump, put the interlock of DC lubricating oil pump into service, check lubricating oil pr. is around 0.12 Mpa.
II) Start jacking oil pump A. put the interlock of pump B into service.
Ill) Open the manual inlet valve for lube oil to turning gear
IV) Push the handle & turn the coupling of the motor by hand at the same time to make the gear engaged. (Put the interlock button in service and the interlock display of CRT turns red in color. When lube oil pr. drops to 0.03 Mpa. It will make the motor to trip)
V) Start turning gear motor, check the reading (.....) & start eccentricity are normal, no abnormal friction & noise are observed. VI) Start smoke exhaust fan A, Put the interlock of fan B into service.

5.13.3Generator cooling H20 outer circulation & inner circulation:

5.13.3.1

Carryout outer circulation:

I. At first generator storage expansion tank is filled demy from demineralized or condensate system (Condensate H_20 comes from C.P. delivery side & demineralized H_2O comes from delivery of condensate transfer pump) sure that Generator cooling water tank is filled up with makeup H_20 (demineralized H_20), check H_20 level is normal.
II. Close the manual inlet valve of rotor, inlet valve of stator & inlet valve of core, open the manual bypass valve (N.B The main coding method for core is air cooling, while water cooling for core is only to absorb some heat caused by magnetic leakage on both side of the core, in normal operation we just monitors the inlet pr. not to measure whe flow rate.
III. Start generator cooling water pump A put the interlock of Pump B into service.

Inform the chemical operator to make an assay of water quality. Once qualified, carry out inner circulation (If necessary then water cooler in operation)

5.13.3.2 Carry out inner circulation:

1) Open the inlet valve of rotor ( ), Intet valve of stator & inlet valve of core ( ) close by-pass valve (.....)
N.B when operating the stator inlet valve, if before overhaul, the cooling water wet in the cooling way. The purpose to do so is to remove some foreign matter or scale deposit in the cooling CKT by by

this back wash method. Water-cooling system of the generator: Rotor Stator: Core:
Pr. =0.3 Mpa Pr. =03 Mpa Pr. =0.3 Mpa
Flow=26 m3/Hr Flow=28 m3/Hr
Ar temp, of generator & main exciter:
Inlet air: 30 Maxm: 40 min:20
Temp, of stator winding: CRT -> 80 ° C
Limiting □ 85 ° C
Difference between winding temp & outlet water temp.□40 "C
Stator: 110/120 ° C, temp, exciter winding 105 ° C
Temp, of maxm cooling water Normal: 30 ° C,
Maximum: 45 ° C, Min: 20 ° C
Outlet water temp, of stator: CRT 60 ° C limit: 80 °C
Outlet water temp, of rotor: CRT 60 ° C limit: 80°C
Standard quality of primary cooling water:
Electrical conductivity □□ 0 5 us/cm: PH >6.8, Cu

5.14 Vacuum Drawing

1. Boiler ignition is Ok.
2. Before vacuum drawing records the metal temp, of cylinders.
3. Start CWP
4. Start OCCWP (N.B note that ampere, Pr. & sound are normal & water level in CCCW tank is normal)
5. Start CCCWP
6. Start CP & put in stand by interlock button of CP. Interlock display turns red in color. Regulate the pr. of CP and normal water level of condenser.
7. Points strike the electromagnetic valve of low load water sprayer to put the sprayer into operation.
8. Switch on CRT display to main steam system & press to open up 3rd stage de superheating system.

5.15 Process of Vacuum Drawing In Condenser

1. Open steam inlet valve #-:V:f ; for startup ejector.
2. Open air valve
3. Vacuum is not Ok start main ejector #
4. Open the 3rd section steam inlet valve of main steam air ejector A1 & then open successively the 2nd & 1st section steam valve.

5. Open the 1st stage U tube drainage valve.
6. Open the air valve of main ejector.
7. Check that the vacuum up of condenser is normal.

5.15.1 Supply steam to start seal:

It is strictly prohibited to supply steam to shaft seal when the rotor is stop.

1. Check that the temp, of shaft seal steam conforms to the journal temp, of HPC/IPC rotors. Maintain shaft seal pr=0.03-0.05 Mpa Adjust regulating valve of de superheating water spray for LP shaft seal & check temp, of steam entering LP shaft seal.
2. Close down the drainage valve of shaft seal steam system when the temp, of shaft seal steam is over 125 ° C
3. Start GSC exhaust fan & regulate the air inlet valve of the fan to maintain vacuum of shaft heater at 4-8 Kpa.
4. Condenser vacuum is over=15 KPa, contact boiler operator to open 1st / 2nd stage by pass, without vacuum bypass not operation.

(N.B Record metal temp, of turbine cylinder & flange is normal check HPC/ IPC, main steam valve, extraction valve & flap NRV are closed .tightly.)

5.16 Feed water to deaerator & pipe warming of gland steam system

1) Open the auxiliary steam valve & regulate the deaerator pr. control valve, so as to feed auxiliary steam to the deaerator to carry out warming up.
2) Open & regulate the HP demineralized water valve, feed HP demineralized water to deaerator control the temp/pr. & pr rise rate within specified range.
3) when deaerator water level rises to normal valve, stop feeding water close the inlet isolating valves are closed tightly. Open the drain valves to carry out pipe warming of gland steam system (the line from deaerator / auxiliary steam manifold to the inlet valve of shaft gland.
4) Start FWP, Boiler water level is normal then stop.

5.17 Turning rotor by steam impulse & sped up

Communicate shift engr. To put hot protection in service

1) Check the normal operation of heat engineering sonic & light signals with test button.
2) Check the normal operation of light display signal for trip protection of main equipment.
3) Put all protective minis witches in services one by one.

4) Put the interlock protection switch of 'boiler trip turbine' in system after contacting boiler operation crew.
5) After checking that the light display of 'main stop valve closed' is not displaying, agree to put 'Turbine trip boiler "& EST protection interlock switches in service by boiler operation crew.

5.18 Pipe Warning Of Steam Turbine

1. During cold start up, the temp, of main steam pipe, reheat St. pipe, auto main stop valve & speed governing valve are the room temp.
2. During the startup, in order to reduce the heat stress caused by temp. diff. & prevent the H2O surging on the St. Turbine, the above pipes & devices must be warned up.
3. The pipe warning of the reheat unit is done by the St. Bypass.
4. Pipe warning of the Rent unit is done by the St. Bypass 1st / 2nd stages bypass to warm up the main St. Pipe & Reht. St. Pipe. Pipe warming by drainage operation.
5. Open drainage valves before & after main St. Gate valves.
6. Open drainage valves of TV1/TV2, RV1 & RV2
7. Open drainage valve of all steam line & continuous blow down cold Reheat Line MPC. Etc. Open all drainages turbine related.

5.18.1 During warm up & rotation temp, increased should be as follows:

a. 100-2000C 40C/min
b. 200- 3000C 30C/ min
c. 300-4000C 20C/min
d. 400-5000C 10C/min
e. 500- above 0.60C/ min

During warm up & rotation the rate of pr. increased as follows:

1-10kgf/cm2 75-80mins
1 0- 40 kgf/cm2 30- 35 m ins
40- 1 00 kgf/cm2 25- 35 mins
100- 140kgf/cm2 20- 35 mins

5.18.2 Before Rolling of Turbine Ensure:

1. Live Steam Temp.=300-320 °C
2. Live Steam Press. =1 .5-2 Mpa
3. Condenser vacuum=6u-70 Kpa
4. Rotor axial Shift
5. Rotor Eccentricity

6. Reheat Stm Temp
7. Reheat Stm Press
8. HPC top Temp=250 °C (over)
9. HPC bottom Temp
10. MPC top Temp
11. MPC bottom Temp
12. Differential expansion (HPC)
13. Differential expansion (IPC)
14. Differential expansion (LPC)
15. Outlet Oil Temp (Oil Cooler)=35-40 °C
16. Difference of Temp. HPC top/bottom=50 °C
17. Difference of Temp. IPC top/bottom =50 °C
18. Degree of super heat main stm & Reht stm not over 500 C.
19. FWP in Operation.
20. Condenser H20level gauge glass are satisfactory.
21. Live stm should meet the following requirements:- Si02 < 20 uμ/L Na+ < 1 0 pg/L Hardness Mgm/cm

Feed water quality:

Fe3+ < 20 μg/L, NH3: 0.6- 1 .2 μg/L
Cu2+ < 5μ/L, 02 Content μg/L
PH : 8.8-9.3 (at 250C)
N2H4: 10-50 μg/L
Boiler H20 quality:
P04 : 9-10(at350C)
R value: (Na+/P04) 2.2-2.8
Electric Conductivity: > 50 [j ohm/crn

22. Temp Difference between left & right portions of main stm & reh stm is not over 170C.
23. Exhaust temp, of condenser: 40-490C

5.19 Put the related protection switches into service

Report shift Engineer that ail the preparations for turbine running up have finished.

- Put I&C protection into service (N.B. If it is the first time to start up the unit just after the major/minor overhaul, putting I&C into protection service should be done with the help of l&C maintenance man.)

  a. Press annunciation test button, check the sound & light alarm signals are normal.

  b. Turn the following protection switches to "ON" position one by one.

  — Axial displacement.
  — HPC/ IPC/LPC differential expansion.
  — Rotor Eccentricity.

— Low Lube Oil Pressure.

- M.B-low vacuum protection switch is usually put into service (namely on position) after synchronization, c. Turn the ETS protection switches to on. d. Turn the 'boiler- turbine' inter tripping protection switch to 'on' position. NB 'boiler -turbine' inter tripping protection switch should be put into service before synchronization.

5.20 Running Up & Speeding Up

- Start HP oil pump, regulate the opening of its outlet valve to control discharge pressure around 1.2Mpa
- Stop AC ( ) lubricating oil pump, put the interlock of AC lubricating oil pump into service (red lamp is on)
- Check the switchover key on DEH back up panel is at 'auto' position.
- Press the reset button, the reset valve will switch on & TV1/TV2/RSV1/RSV2 is fully open.
- Select 'speed control' operating panel, press ' GV control '
- Set the target speed to '500' rpm, acceleration rate '50' r/min, press 'confirm' press 'go', 'go' button is on.
- Check GV1/GV2 are opened gradually with the same lift at the same time.
- Check IV1/IV2 are opened gradually with the same lift at the same time.
- Check turbine speed rises smoothly (NB when turbine speed is over 62 rpm, check the turbine gear is forced out of engagement & its motor is stopped automatically. Close the inlet valve of STG manual valve. Carefully listen to the sound of all running parts of T-G set, & make an overall check & contact the boiler operator to keep the pressure & temp, of steam stable. At 500 rpm warm up time=15 minutes
- When turbine speed rises to 500 rpm, "hold" button is 'on'. "Go" button is 'off. The speed is controlled around 500 rpm. When the speed is up to 500 r/min, stop jacking oil pump & make the interlock of jacking oil pump exit.
- Set target speed to '1600' rpm, acceleration rate '55' r/min .press 'confirm' press 'go', 'go' button is 'on', 'hold' button is off.
    - Matters to be noted & regulation during warm up & speed up
    - Listen carefully to the normal sound of running parts.
    - Bearing vibration must not exceed 0.03 mm when turbine speed is 1300 r/min
    - Bearing vibration must not exceed 0.08 mm when turbine speed is crossing the critical speed.
    - When vibration is over the above valves, it is not allowed to eliminate vibration by the way speeding down. The turbine should be tripped & shut

down immediately. When bearing is carried out, note the deflection of is shaft & Amp. Of the bearing motor. The turbine can be start up again only when the shaft is straightened by barring & there is no abnormal sound of the moving parts.

- The T-G set should quickly & steadily cross over its shaft critical speed (1 150-1350 rpm).The rate of speed up should be controlled automatically in the range of 500 rpm (with in the range of critical speed, it is of no effect to push the button 'keep' .Record the maximum amplitude of the vertical vibration of its bearing when crossing over the critical speed.
- Check that the expansion of cylinder is normal, & relative expansion is within allowable range.
- The rise & temp, difference of metal temp. At all parts of turbine are not over the rated valve.
- The valve of axial displacement & temp, of the thrust bearing pads are normal.
- The temp, of the exhaust steam of LPC must not exceed 1 20 °C
- Regulate the water level of condenser at all times & notify the chemist to make an analysis of water quality. When it is acceptable, open up water outlet valve of LPH#4 gradually & close discharge valve of condensate & adjust there cur. Regulating valve. Switch the return water of cooling water of main stop valve & (CATS PAW} to condensate system.
- Pay attention level in LPH startup drainage pump A or B as required by the water level in LPH#2, & put the interlock button of standby drainage pump in service. The interlock display turns red in color.
- Note the vacuum in condenser & regulate the steam pressure of HP/LP shaft gland seal.
- Regulate the inlet pressure, temp & flow of cooling water of generator & the temp, of air cooler of generator & exciter.
- Note the pressure, temp., flow & level of oil. (The outlet oil temp. of oil cooler should be kept at 40 CC & the temp, rise of lube oil of all bearing kept at lower than 15 °C Cut put oil header according to oil temp.

- The speed rises continuously to 1600 rpm. (NB the critical speed region of unit #1 is 1150-1350 rpm, when speed rises into this region, the computer will automatically change the acceleration rate to 3000rpm so as to ensure the turbine can pass through it quickly.
- During that period, to press 'hold' button will be futile. When the speed is over 1350 rpm, the computer will automatically change the acceleration rate back to previous setting value that is 55 rpm.
- Before turbine speed reaches 2000 rpm, contact boiler crew to increase the pressure of

- !main stoma close the 1st & 2nd stage bypass
- a little & close the drainage valves of main steam & reheat steam pipes little, close down the vacuum breaking valve, & put in one set of steam ejector to up the vacuum in condenser.
- When turbine speed reaches 2500 rpm, attention to action governor system & gradually closes down governor valves.
- Care about the steady rise of turbine speed & steady operation at 3000 rpm.
- Stop the operation of governor oil pump when the outlet oil pressure of main oil pump is slightly higher than that of governor oil pump, & note that there are no vibrations in oil pump & put in service the interlock button of governor oil pump. The interlock display turns red in color.
- When turbine speed is 3000 rpm, measure the vibration value of all bearing in three directions (longitudinal/transverse & vertical).When these values are normal.
- Carry out necessary tests (if overspend test of emergency governor is to be carried out, the temp, of inner casing should be over 200 °C)

5.21 Generator Cooling System Specification

5.21.1

1) Stator cooling water flow rate:
Normal: 36 m3 /Hr, Abnormal: 29 m3/Hr
2) Rotor cooling water flow rale: Normal: 27 m3 /Hr Abnormal: 21 m3 /Hr
3) Rotor coil water pressure in: Normal: 0.2-0.3 Mpa Abnormal: 0.1 Mpa lower than normal
4) Rotor water pressure in: Normal: 0.2-0.3 Mpa 0.4 Mpa & Abnormal: < 00.1 Mpa
5) Normal: 0.2-0.3 Mpa Abnormal: 0.1 Mpa lower than normal.
6) Filter pressure drop high: Normal: Field test Abnormal: 20 Mpa higher than normal
7) Cooling water temp, in: Normal: 20-40 °C, normal:-: 15°C & > 45 °C
8) Wstet cooler raw water flow rate. 125 rn3/Mi'
9) Water cooler raw
10) Water cooler raw Pressure in:0.20 MPa
11) Water level in water tank: Normal: Over flow Abnormal: □ 750 mm level gauge
12) Conductivity (--Abnormal: □ 9.5 □s/cm Abnormal .9.5□s/cm
13) PH value: 7-8
14) (.....):□100 micro gram equivalent per litre

5.21.2 Time allocation for startup is follow

Time allocation for startup is follow						
Speed (rpm)	Time (min)	Rate of speed Up (rpm)	Temp, of HP Fixed blade Annulus °C	Expansion of Cylinder as a Whole (mm)	Condenser Vacuum (kpa)	Remarks
0-500	10	50	60	1	65	
Keep at 500	15		60	1	65	
500-1600	20	55	90	2.5	72	
Warm up at IOUU	15		90	2.5	72	
1600-2500	10	90	130	3.5	80	
Warm up at 2500	10		130	3.5	80	
2500- 3000	10	50	>150	5-6	Full vacuum	

Time duration from rotor turning by steam impulse to full speed about 90 min. The deviation of startup may be shortened or prolonged according to the state of cylinder expansion & hp diff. expansion considered as a whole.

5.22 Environmental Aspect, Impact & Controls

Any activity at the plant, whether it is carried out for ensuring quality of service or meeting requirement of the interested parties, there will be some environmental aspects associated with it. It is a requirement of the IMS of BPDB to identify those environmental aspects, evaluate their impact and determine necessary controls.
While carrying out the activities and operation, the employees of BPDB need to exercise appropriate and predetermined controls so as to prevent or mitigate any adverse impact that may be associated with the activity or the process.
Some examples of environmental aspects associated with the procedure for Operation and Control of Auxiliary Systems-Coal Power Plant are as below:

Sl Nos.	**Aspect**	**Impact**	**Controls**
1.	Electricity Consumption	Global Warming	1. Ensure Components are running efficiently
2.	Water Use for Cooling	Water Use	1. Ensure that therer is no leakage for water delivery
3.	Fly Ash & Bottom Ash	Air Pollution	1. Sold to cement manufacturer where it will be utilized in buildings and wont pollute land / air

4.	Fly Ash & Bottom Ash	Air Pollution	1. Sold to cement manufacturer where it will be utilized in buildings and wont pollute land / air
5.	Paper Use	Natural resource depletion	1. Reuse of Paper with the blank side
6.	Recruitment of incompetent people	Inadequate knowledge on operation and environmental management may lead to unnecessary environmental pollution	1. Awareness training given periodically to relevant staffs on environmental management issues 2. On-job training related to environmental awareness given to staffs and workers.

The table above provides examples only. The IMS team of each site needs to identify the aspect impact and controls related to specific activities and ensures that the environmental performance of the organization is effectively maintained. For this purpose, the procedure “Environmental Aspect Impact Assessment Procedure” is to be followed and forms “Environmental Aspect Impact Register” is to be filled up by the IMS team.

5.23 OHS Hazard, Risk & Controls

Any activity at the plant, whether it is carried out for ensuring quality of service or meeting requirement of the interested parties, there will be some occupational hazards with it related to the occupational health and safety (OHS) to the workers and employees. It is a requirement of the IMS of BPDB to identify those OHS hazards and determine necessary controls.
While carrying out the activities and operation, the employees of BPDB need to exercise appropriate and predetermined controls so as to prevent or mitigate any adverse consequence that may be associated with the activity or the process.
Some examples of OHS hazards and with the procedure for Operation and Control of Auxiliary Systems-Coal Power Plant are as below:

Sl Nos.	OHS Hazard	Controls
1.	Boiler Shell Explosion	1. Regular Inspection and maintenance 1
2.	Boiler Overheat	1. Regular Inspection and maintenance
3.	Inhalation of PM	Use PM filter
4.	High Noise Level	1. Staff must wear Earmuff whilst in the Engine room

5.	Slipping due to water spillage on floors	1. Maintain adequate housekeeping. 2. Maintain signage if there is any spill.
6.	dropping / falling object	1. Maintain adequate PPE (e.g. Helmet) whilst at worksite
7.	Electric shock / Electric Arc	1. Ensure a Permit to Work is issued as per guidance before personnel is sent for work 2. Maintain LoTo Procedure 3. Maintain adequate PPE whilst at worksite
8.	Fire / Explosion at worksite	1. Follow the 'Prevention of Fire and Explosion' Procedure
9.	Heat Stress	1. Ensure Heat Stress Training for all the employees 2. Ensure a good work plan
10.	Getting Stuck in moving / Rotating Parts	1. Ensure protocols are maintained, such as not leave loose long hair, or loose long dress 2. Proper signage 3. Maintain barrier / mark area so that when personnel enter that zone, he/she is obliged to take adequate precautions
11.	Chemical Spillage / Burn	1. Provide Necessary Training 2. Maintain adequate PPE whilst at worksite 3. Ensure good House Keeping
12.	Burn from contact with hot surface	1. Use of Guards to ensure contact can't be made directly 2. Provide Caution Sign 3. Maintain adequate PPE whilst at worksite
13.	Fumes and gases	1. Maintain adequate PPE whilst at worksite 2. Ensure a Permit to Work is issued as per guidance before personnel is sent for work
14.	Light from welding	1. Provide Necessary Training 2. Maintain adequate PPE whilst at worksite 3. Proper Supervision
15.	Unhygienic work environment e.g. canteen, toilet etc	1. Maintain adequate housekeeping.
16.	Cuts from Material Handling / movement	1. Maintain Material handling Procedure 2. Ensure a Permit to Work is issued as per guidance before personnel is sent for work

17.	Poor Visibility due to improper lighting	1. Maintain adequate housekeeping. 2. Installing adequate Lighting
18.	Lifting heavy objects	1. Maintain Material handling Procedure 2. Ensure a Permit to Work is issued as per guidance before personnel is sent for work
19.	Dusty environment	1. Ensure adequate housekeeping
20.	Leaking Gas Supply Pipeline	1. Check LEL detector Status
21.	Possibility of flamable gases/fumes in engine room chamber	1. Follow the 'Prevention of Fire and Explosion' Procedure
22.	Fire on transformer	1. Regular Inspection and maintenance 2. Follow the 'Prevention of Fire and Explosion' Procedure

The table above provides examples only. The IMS team of each site needs to identify the OHS hazards and necessary controls related to specific activities and ensures that the environmental performance of the organization is effectively maintained. For this, the procedure Hazard Identification and Risk Assessment Procedure is to be followed and Hazard Identification and Risk Assessment Register is to be filled up by the IMS team.

6.0 References

None

7.0 Appendix

None

8.0 Revision History

Sl No.	Revision Number	Section	Change Made	Date of Revision

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