1. Work instructions Gas cutting & welding work in the BF Gas system

Objective	Gas cutting & welding work in the BF Gas system
Responsibility	Mechanical Engineer in charge
PPEs to be used	Helmet, Safety shoes, safety hand gloves, ear plugs and nose mask

Aspect-Impact

Oil Spillage	Land contamination, RESOURCE DEPLETION
Oil traced waste generation	Land contamination & Resource Depletion
Generation of waste oil	Generation of hazardous waste, resource depletion
Dust generation	Air Pollution
Waste water	Resource Depletion

Hazards Identified

Mechanical Hazard	Slip, fall and trap
Physical hazard	Noise,
Human behavior	improper housekeeping, Non PPEs, Alcoholism,Violation system
Chemical hazards	CO gas poisoning

PRECHECKS

Take/ensure the work permit and electrical shut down of the blower.
Ensure both 'U' seal at PID and of BF3 Gas line DG set and Boiler-2 U-seal is filled from operation department and isolated with LOTOV.
Ensure multi isolation in BFG system along with U-seal.
Complete BFG gas line isolation and complete air purging through boiler ID fan.
Vent should be open of before and after PID Shut Off Valve and BF3 Shut Off Valve near DG set of PP1.

PROCEDURE.
Take clearance from production department for working on the Gas system.
Cutting/welding operation can be carried out on Gas system only during complete BFG shutdown and after complete purging through Boiler ID fan and after purging blower inspection doors should be kept open.
Workmen and engineer concern should ensure the Co level at the work place and proper circulation of fresh air at the work place.
Carry out the cutting/welding operation as per work procedure SP 44K, WI/MAINT/07,WI/MAINT/09.

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After completion of job close all manholes, take trials and give clearance to the production department.

2. Work instructions air leak test in the BF Gas system

Objective : Procedure to carry out air leak off test
Scope : Air leak test.
Responsibility : Mechanical Engineer In charge
PPEs to be used : Helmet, Safety shoes, safety hand gloves, safety belt, CO monitor

Aspect	**impact**
Dust generation	Air Pollution
Compressed Air Wastage	Resource Depletion

Hazards identified

Mechanical Hazard - Falling
Physical hazard – Air pressure
Chemical Hazard – BF Gas
Human Behavior--- improper housekeeping, Non PPEs, Alcoholism, system Violation.

Procedure

- Ensure complete BFG isolation in blower system.
- After completion of box up commence to air fill test.
- Close all vent, drain line valve which was provided in system.
- Charge entire line by slowly filling of air and hold the line pressure 500 mmwc
- Check the any leakage in each joint by putting soap solution.
- Attend the leakage portion and repeat the same exercise.

3. **Work instructions for bfg U seal drain valve replacement and drip pot cleaning**

Objective U seal drain valve replacement and drip pot cleaning
Responsibility Mechanical Engineer in charge
PPEs to be used Helmet, Safety shoes, safety hand gloves, ear plugs and nose mask

Aspect-Impact

Dust generation Air Pollution
Waste water Resource Depletion

Hazards Identified

Mechanical Hazard Slip, fall and trap
Physical hazard Noise,
Human behavior improper housekeeping, Non PPEs, Alcoholism,Violation system
Chemical hazards CO gas poisoning

PRECHECKS

Take/ensure the work permit and electrical shut down of the blower.
Complete BFG gas line isolation has to be isolated by using U-seal and Valves.
Ensure U-seal prior to whose drain valve (i.e. At PID-1) has to be replaced is filled and drain valve of that U-seal is locked with LOTO.
BFG gas line PCV valve at PID-1 has to be isolated.
Ensure U-seal at other end (i.e. from BF-3 End is also filled and drain valve is locked with LOTO.
Complete air purging by using boiler ID fan.

PROCEDURE;

Drip Pot cleaning:

After getting all clearance from operation department start the drip pot filling valve opening.
Check the line got chocked, if chocked try to hit pipe line manually by gun hammer.
If chock got not cleared close the close the drip pot filling line.
Start remove the drip pot bottom dummy and clean the entire wet dust or hard mud particle.
Flush the line completely by 10 to 15 min by opening water filling line.
After entire line flushing again put the dummy on drip pot bottom flange.
Fill the drip pots and overflow the same and give clearance to operation department.

Drain Valve Replacement:

For replacement of drain valve, ensure that U-seal is completely drained and purged by using ID fan and may be by compressed air. Check for presence of CO by opening U-seal vent valve.
After CO is found zero, drain valve can be removed by using spanners. If bolts are not getting opened, same can be cut by gas cutting and valve can be taken out.
Clean the U-seal by flushing with U-seal filling valve and may be by poking with rod.
Replace new Valve with new gasket and hardware. Fill U-seal with water and check for leakage. If no leakages found, normalize the Isolation.
Clear the work permit and give clearance to operation.

4. Work Instruction for Maintenance of Blowers and Fans

Objective	Servicing of Blower and Fans
Responsibility	Engineer in charge
PPEs to be used	Helmet, Safety shoes, safety hand gloves, ear plugs and nose mask

Aspect-Impact

Oil Spillage	Land contamination, RESOURCE DEPLETION
Oil traced waste generation	Land contamination & Resource Depletion
Generation of waste oil	Generation of hazardous waste, resource depletion
Dust generation	Air Pollution
Waste water	Resource Depletion

Hazards Identified

Mechanical Hazard	Slip, fall and trap
Physical hazard	Noise,
Human behavior system	improper housekeeping, Non PPEs, Alcoholism, Violation
Chemical hazards	CO gas poisoning in Area near Equipment

PRECHECKS

Take/ensure the work permit.
Ensure both suction & discharge valves are closed from operation department.
Ensure CO level in gas prone area is zero.
Take electrical Isolation of the Equipment.

PROCEDURE

After getting all clearance from operation department start to open inspection door.
Inspect Impeller for any damage or crack.

Inspect coupling guard, its hardware. Remove the coupling guard and inspect the coupling for any abnormality.
Check for alignment and note the readings.
In case of resilient type coupling, check coupling spring. For any type of damage replace the same.
Replace old grease with new grease in coupling. Couple the equipment. Put back coupling guard with hardwares.
For Fan directly mounted on shaft, no coupling and its guard will exist.
For Pulley mounted Fan, Inspect bell and pulley condition. In case of belt looseness on pulley adjust the same.
For damaged belt replace with new one.
Inspect Fan and Motor Base bolts for tightness. In case of looseness, tighten the same.
Open top cover of Plummer Block check for tightness of lock nut.
Replace old grease with new grease. In case of oil lubricated, Check oil level, Drain 10% of oil and top up the same.
Refit the top cover of Plummer Block.
Check operation of IGV and Discharge Valve for freeness.
Check casing seal of shaft for any leakage or if damage gland packing, replace the same.
Normalize the Equipment.
Clear Electrical and Work Permit for Trial.
Note vibration during trial. Vibration should be less than 4 mm per sec.

5. Work instructions Servicing/Overhauling of Fan and Blower

Objective	Servicing of Blower and Fans
Responsibility	Engineer in charge
PPEs to be used	Helmet, Safety shoes, safety hand gloves, ear plugs and nose mask

Aspect-Impact

Oil Spillage	Land contamination, RESOURCE DEPLETION
Oil traced waste generation	Land contamination & Resource Depletion
Generation of waste oil	Generation of hazardous waste, resource depletion
Dust generation	Air Pollution
Waste water	Resource Depletion

Hazards Identified

Mechanical Hazard	Slip, fall and trap
Physical hazard	Noise,
Human behavior	improper housekeeping, Non PPEs, Alcoholism, Violation system
Chemical hazards	CO gas poisoning in Area near Equipment

PRECHECKS

Take/ensure the work permit.
Ensure both suction & discharge valves are closed from operation department.
Ensure CO level in gas prone area is zero.
Take electrical Isolation of the Equipment.

PROCEDURE

After getting all clearance from operation department start to open inspection door.
Inspect Impeller for any damage or crack.
Inspect coupling guard, its hardware. Remove the coupling guard and inspect the coupling for any abnormality.
Decouple the Fan from motor. Push back motor, such that sufficient space is available to remove coupling.
Remove Coupling with Puller, Hydraulic Jack. If Coupling is coming jammed, Heat with cutting set uniformly.
After coupling gets removed. Loosen the top cover of Plummer block of DE, Remove the base bolt of Housing at DE.
Loosen the locknut of bearing in housing.
Remove Bearing of Drive End with Puller or Chisel and Hammer.
Similarly remove Plummer Block and Bearing of NDE of Fan.
Install new bearing with grease in shaft and housing at NDE. Similarly install new bearing with grease in Plummer block housing and shaft of DE.
Fix both housing with base bolt at Pedestal. Tighten the bearing in Plummer Block with Locknut.
Before Tightening, Ensure side clearance of bearing and bearing should not be more than 0.05 mm.
Put Back Top Cover of Plummer block.
Install the Coupling into shaft of Fan if required by uniform heating the coupling.
Do the alignment of Fan with motor. Please note the readings.
Alignment reading should be +- 0.005mm. Max. Difference of 0.01 mm.
Couple the Equipment. Put back the guard.
Normalize the areas disturbed in Equipment.
Clear electrical isolation and take trial to ensure rotor in balance position.
During trail if rotor found unbalance that case balancing of same to be initiated by coordinating with operation and electrical department.
User must be write note on electrical permit before start the balancing and inform the operation department.
Permit requestor ensure in any work in blower area during balancing LOTO with individual isolation (one man one lock) available at site only.
Balancing each trail will be carried out under close coordination of site supervisor, DCS engineer and electrician.
After completion of blower balancing again electrical isolation ensure and start the blower box up.
In case of impeller replacement or leakage from casing flange, dismantle the casing.
Remove by using chain block. Check for gasket damage, if required replace the same.

Remove the impeller by dismantling casing suction cone. Remove the impeller put back the same with new impeller.
Take Trial and check Vibration reading. Same should be less than 3.0mm per sec.

6. Dynamic Balancing of BFG Blowers and Fans

Objective	Balancing of BFG Blower
Responsibility	Engineer in charge
PPEs to be used	Helmet, Safety shoes, safety hand gloves, ear plugs and nose mask

Aspect-Impact

Oil Spillage	Land contamination, RESOURCE DEPLETION
Oil traced waste generation	Land contamination & Resource Depletion
Generation of waste oil	Generation of hazardous waste, resource depletion
Dust generation	Air Pollution
Waste water	Resource Depletion

Hazards Identified

Mechanical Hazard	Slip, fall and trap
Physical hazard	Noise,
Human behavior	improper housekeeping, Non PPEs, Alcoholism, Violation system
Chemical hazards	CO gas poisoning in Area near Equipment

PRECHECKS

Take/ensure the work permit.
In case of BFG Blower, Ensure suction and Discharge U-seal are filled and LOTO is applied from both operation and maintenance.
In case of FD Fans, Ensure Boiler Individual U-seal are filled and LOTO is applied. Also both IGV & discharge valves are closed from operation department and LOTO is applied.
Ensure CO level in gas prone area is zero.
Take electrical Isolation of the Equipment.

PROCEDURE

User must be write note on electrical permit before start the balancing and inform the operation department.
Permit requestor has to ensure in any work in Fan and blower area during balancing, LOTO with individual isolation (one man one lock) available at site only.
Balancing each trail will be carried out under close coordination of site supervisor, DCS engineer and electrician.

In this case either the shaft should have been isolated, secured and at zero energy or the machine guard should have been in place.
Permits should not be issued before the relevant authority has physically verified isolation and zero energy at the site.

After getting all clearance from operation department and ensuring LOTO, start to open inspection door.

Inspect Impeller for any damage or crack or dust deposition.
If deposition of dust is found on impeller, clean the impeller thoroughly
Rotate the impeller to check the point of static unbalance and consequently identify the location for welding of trial mass. Trial mass is selected based on diameter and weight of impeller. Put reflecting sticker on impeller shaft for measuring the phase angle.

Balancing and similar activities to be done through non-driving end or by making arrangement of small opening/slot in the guard itself, such that guard cannot be removed.

Close the inspection door, put dummy in both suction and Discharge duct.
Clear the electrical isolation after removing all the locks on LOTO box and panel.
Co-ordinate with control room Engineer for starting BFG Blower. Control room Engineer should consequently take clearance from shift electrical person (Technician/Engineer). Before starting Blower, Maintenance Engineer should ensure no-man is in line of fire. No loose material should be near equipment.
Take first set of trial reading. Note down the vibration and phase reading.
Stop the Blower/Fan and isolate the equipment. Bring LOTO Box back to site, ensure personal LOTO of each person working on balancing job.
Open the inspection door, weld the suitable size trial mass on identified location as suggested by CBM/Balancing Expert.
Close the inspection door. Clear the electrical isolation after communication with control room Engineer. Start the BFG blower along with co-ordination of both Desk Engineer and Shift electrical.
Take second set of reading which is based on trial weight.
Based on trial weight, vibration and phase reading is utilized for identification of correction weight.

Similarly repeat the process by welding correction weights at calculated phase angle recommended by balancing/CBM expert.

Process is repeated until the vibration reading is reduced below 3 mm/sec.
If Vibration is not reducing below 3 mm/sec, clean the impeller again, Attend any other recommendation suggested by CBM/Balancing expert.

After completion of blower/Fan balancing again electrically isolate the blower and start the blower box up.

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