**ACTIVITY: STOVE AND ITS ACESSORIES MAINTENANCE**

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* Objective : - Safe Maintenance of Stoves & its Accessories.
* Scope : - Blast Furnace Accessories
* Ref. : -
* Responsibility : - Engineer In charge & Maintenance Fitter on the job

PPE –s to be used :

* Helmet, Safety shoes, hand gloves and cotton cloth
* Mandatory safety PPE for Hot Blast valve changing & gasket/rope replacement of HBM side of HBV : Face shield, leather jacket in addition to above mentioned safety PPE’s to avoid contact with hot water/steam during cooling water hose replacement

**Work No 1 : Maintenance of Valves**

# Work No 2 : Valve changing

# Work No 3 : Hydraulic cylinder changing

# Work No 4 : Valve hydraulic hose changing

# Work No 5 : Valve hydraulic oil leakage arresting

**Work No 6 : Hose changing (Water)**

**Work No 7 : Valve lubrication**

**Work No 8 : Valve cleaning**

**Work No 9 : Valve flanges leakage arresting**

**Work No 10 : Hydraulic pipeline painting**

# Work No 11 : Counter weight adjusting and chain/rope changing

# Work No 12 : Checking of chain/rope for counter weight

**Work No 13 : CA Fan bearing/bearing block changing**

**Work No 14 : CA Fan impeller changing**

**Work No 15 : CA Fan coupling bush replacement**

**Work no 16 : Hot blast main expansion bellow enveloping**

**Work no 17 : Hot blast valve rope/gasket replacement (Stove Side)**

**Work No 18 : Inspection & maintenance of chimney valve by opening**

**bottom inspection flange**

**Work No 19 : Grouting points welding.**

**Work No 20 : Hot blast valve expansion bellow enveloping.**

**Work No 21 : Hot blast line expansion bellow replacement.**

**Work No 22 : Balancing of HBS CA FAN**

###### Aspect-Impact

|  |  |
| --- | --- |
| Oil Spillage | Land contamination |
| Oil traced waste generation | Land contamination & Resource Depletion |
| Fire | Air pollution SP42 |
| Scrap generation | Resource depletion |
| Fumes | Health |

Hazards identified

Physical Hazard - Pressure, temperature

Mechanical Hazard - Trapping between two objects,

Fall of material, hammer, tools, slinged items, bolts,

wedges

Fall of person from platform, height

Entanglement

Impact of moving / slinged items

Splashing of water into the eyes during back flushing

Hot water or steam can come with contact with body

Splashing of oil into the eyes & body

Hot air come contact with body and equipment

Electrical hazard - Shock

Chemical hazard - Co gas poisoning & Fire

Biological Hazard - Bee sting

**Before carrying out all above activities’ inspection for Honey Bee Hive to be done.**

**Work No 1: Maintenance of Valves**

1. ***Gland changing/gland tightening of VALVES***
2. This activity is to be done on shut down day.
3. Take production clearance and work permit for changing of glands.
4. Ensure that stove is in isolated stage
5. Take Electrical shutdown from electrical engineer for electrically operated valves like air/gas shut off valve, Air pre heater inlet/outlet & bypass valves. For hydraulically operated valves Power pack shutdown needs to be taken & Isolation valve needs to be closed of respective valve. Use mechanical LOTO to manually operated valves & hydraulic power pack valves.
6. Check the CO gas level before starting of job and should start the job only if Co level is within limit (below 50 ppm).
7. Loosen the gland pusher and remove old rope.
8. Fit new graphite square rope of required size (16mm) and tighten the gland pusher.
9. Open the ball valve from powerpack.
10. Clear Electrical shutdown.
11. Take valve trial and give clearance to production department.

**Work No 2: Valve Changing**

**A. *Valve changing - GSV***

1. Close the Google valve & Shut off valve of the gas & take electrical shutdown.
2. Purging of gas line is required before starting of job. Res-operation
3. Take work permit from production for changing of valve
4. Ensure that the stove is isolated and put in field mode.
5. Ask electrical/instrumentation to remove the limit switches.
6. Disconnect the actuator.
7. Then remove valve by slinging it properly to lifting lugs with the help of chain blocks (capacity 1-2T).
8. Remove old gaskets and clean the flanges.
9. Shift old removed valve at side and fix the new/overhauled tested valve. Check the flow direction arrow.
10. Place new gaskets and tighten the bolts fully flanges.
11. Give electrical connection by clearing the shut down
12. Open the top inspection door to check disc while setting valve for fully open and fully closed condition.
13. Take trials, set the limit switches and give clearance.
14. Then close the inspection door

**B. *Valve changing - CASV***

1. Take s/d of both the CA fans
2. Gas line goggle & shut off valve to be kept in close condition & electrically isolated with LOTO.
3. Gas line to be purged before starting of the activity.
4. Take work permit from production for changing of valve.
5. Ensure that the stove is isolated and withdrawn from PLC auto mode.
6. Ask electrical/instrumentation department to remove the limit switches.
7. Decouple the actuator and remove the same safely
8. Then remove valve by slinging it properly to lifting lugs with the help of chain blocks (1-2T capacity).
9. Remove old gaskets and clean the flanges
10. Shift old removed valve at side and fix the new/overhauled tested valve. Check the flow direction arrow.
11. Place new gaskets and tighten the bolts fully of flanges.
12. Clear the electrical shut down of CASV.
13. Open the top inspection door to check disc while setting valve for fully open and fully closed condition.
14. Take trials set the limit switches and give clearance.
15. Then close the inspection door
16. Clear the shutdown of both the CA fans. & goggle valve.

**C. *Valve changing - CBV And CBBV***

1. ***Furnace shut down is required for changing of this valve***
2. Take work permit from production for changing of valve.
3. Ensure that oxygen valve is in close condition while carrying out hot work.
4. Ensure that the stove is isolated and withdrawn from PLC auto mode.
5. Close the hydraulic power pack stand shutoff valve of respective stove valve and also the main shut off valve of the stand & LOTO – Resp- Mechanical engineer
6. Ensure that the GSV is close.
8. Ask electrical/instrumentation department to remove the limit switches.
9. Remove hydraulic hoses, mark the direction on the hoses for opening and closing and also put plug for the hoses.
10. Collect the oil in the oil can while opening the hoses.
11. Then remove valve by slinging it properly and with the help of hydra (12T)
12. Remove old gaskets and clean the flanges
13. Shift old removed valve at side and fix the new/overhauled tested valve. Check the flow direction arrow.
14. Place new gaskets and tighten the bolts fully of flanges.
15. Connect back the hoses. Clear electrical shutdown.
16. Take trials set the limit switches and give clearance.
    1. ***Valve changing - Chimney Valve***
       1. While changing CV ensure that work should be stopped when stove is depressurized. Ask production to communicate.
       2. Take work permit from production for changing of valve.
       3. Ensure that the stove is isolated and withdrawn from PLC auto mode.
       4. Close the hydraulic powerpack stand shutoff valve of respective stove valve and also the main shut off valve of the stand & apply mechanical LOTO – Resp- Mechanical engineer
       5. Ensure that the GSV is close.
       6. Ask electrical/instrumentation department to remove the limit switches.
       7. Remove hydraulic hoses, mark the direction on the hoses for opening and closing and also put plug for the hoses.
       8. Collect the oil in the oil can while opening the hoses.
       9. Then remove valve with the help of hydra (12T)
       10. Remove old gaskets and clean the flanges
       11. Shift old removed valve at side and fix the new/overhauled tested valve. Check the flow direction arrow.
       12. Place new gasket on chimney duct side tightens the bolts fully and then place gasket on stove side and tighten the bolts fully.
       13. Take trials set the limit switches and give clearance*.*

**E. *REPLACEMENT OF HOT BLAST VALVE***

1. Furnace shut down is required for changing of this valve
2. 100/150 T crane with required boom length is to be used for valve replacement.
3. Take work permit from production for changing of hot blast valve.
4. Ensure that the stove is isolated, depressurized and withdrawn from PLC auto mode. Inform BF control room to start & keep the PCI waste gas fan running till the valve replacement activity is completed.
5. Close the hydraulic power pack stand shutoff valve of respective stove valve and also the main shut off valve of the stand and apply mechanical LOTO- Responsibility mechanical engineer.
6. Close cooling water valves of hot blast valve and start removing the hoses of disc & body jacket.
7. Ask electrical/instrumentation department to remove the limit switches.
8. Remove hydraulic hoses, mark the direction on the hoses for opening and closing and also put plug for the hoses.
9. Collect the oil in the oil can while opening the hoses.
10. Cut and remove platform & obstructing cooling water pipes above the valve
11. Properly sling the valve operating structure with 32 mm or 5T belt sling dia wire rope sling with the 100 T/150 T crane hook.
12. Loosen / gas cut and remove operating structure mounting bolts, and remove the operating structure and place it at safe place after lowering it on ground.
13. Properly sling the hot blast valve to be dismantled with 32 mm dia wire rope sling with the 100 T crane hook.
14. Loosen / gas cut and remove the bolts of valve flange towards hot blast header.
15. Loosen / gas cut and remove the bolts of valve flange towards expansion bellow.
16. Compress the tie rods and remove the spiral gasket.
17. Then slowly remove valve with the help of crane in close co-ordination with the crane operator
18. Lower old hot blast valve and place it in safe place and then lift the new valve by crane, ensure water jacket and valve disc is filled with water (to prevent valve disc from getting over heated).
19. “**ENSURE VALVE FLOW DIRECTION TOWARDS HBS MAIN (Indian make valve).”**
20. Place the valve and lock in position with few bolts on either side then put balance bolts on both sides on the lower half.
21. Give temporary rubber water hose connections for disc cooling using quick coupling.
22. Connect body cooling inlet and outlet water pipeline to main header and drain respectively.
23. Loosen the tie rods and then tighten the flange bolts after placing 2 runs of style 123 (round shape) asbestos rope in between the flanges on either side of valve.
24. Fix the valve operating structure, platform in position and tighten the bolts.
25. Tighten the flange bolts fully
26. Give permanent water connections to the disc, ensure inlet water supply to disc is throttled to avoid steam formation and person replacing it is wearing face mask & leather jacket to avoid contact with hot water and steam
27. Check the water flow through the outlet pipe of disc & body of valve
28. Connect the hydraulic hoses and also ask the electrical to give limit. Clear electrical shutdown.
29. Remove mechanical LOTO & Open the shutoff valves in the hydraulic power pack.
30. Take trial and set valve for full opening and closing.
31. Inform sealing agency to seal the gap between the flanges on either side of valve (If gaskets not used)
32. Ensure proper housekeeping, clear the work permit and hand over to production dept.

Note: For HOT BLAST VALVE

Bonnet mounting flange to disc top distance to be maintained is 817

As show in below diagram.



HOT BLAST VALVE

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Sr No** | **Description** | **Min stroke length (MM)** | **Max stroke length (MM)** | **Present Stroke length (MM)** | **Bonnet top to disc stem top as per drawing (MM)** |
| 1 | Hot blast valve#1 | **1170** | 1280 | 1280 | 817 |
| 2 | Hot blast valve#2 | **1170** | 1270 | 1255 | 817 |
| 3 | Hot blast valve#3 | **1170** | 1280 | 1280 | 817 |
| 4 | Burner valve#1 | **860** | 890 | 890 | 600 |
| 5 | Burner valve#2 | **860** | 920 | 905 | 600 |
| 6 | Burner valve#3 | **860** | 890 | 890 | 600 |
| 7 | Backdraft valve | **850** | 890 | 850 | 600 |
| 8 | Mixture shut off valve | **775** | 890 | 775 |  |

1. ***REPLACEMENT OF BURNER VALVE***

* + - * 1. Wind Reduction / furnace shutdown is required to be done for changing of this valve.
        2. 100T Crane to be used
        3. Take work permit from production for changing of valve.
        4. Obtain electrical shutdown for Gas and Air shutoff valves of particular stove.
        5. Ensure that the stove is isolated and withdrawn from PLC auto mode. Keeping Chimney valve & chimney bypass valve in open condition.
        6. Dismantle actuators of GRV & ARV to prevent burning of actuators, due to flames coming out at the time of dismantling the burner valve.
        7. Close the hydraulic power pack stand shutoff valve of respective stove valve and also the main shut off valve of the stand and apply mechanical LOTO – Resp- Mechanical engineer.
        8. Disconnect the Hydraulic hoses of Hot Blast valve, cold blast valve, Cold blast Bypass valve and loop the open & close hoses respectively with proper tagging.
        9. Close the HBS main BF gas shutoff valve and goggle valve. (1000 dia) & take electrical shutdown.
        10. Remove the upper side flange fasteners of Gas shut off valve of particular stove, insert dummy plate and fasten the same. Ensure there is no gas leakage.
        11. Inform BF control room to normalize the system, increase the wind volume.
        12. Close cooling water main header valves of burner valve and start removing the hoses of disc & body jacket.
        13. Ask electrical/instrumentation department to remove the limit switches.
        14. Remove hydraulic hoses, mark the direction on the hoses for opening and closing and also loop the hoses.
        15. Collect the oil in the oil can while opening the hoses.
        16. Inform BF control room to start & keep the PCI waste gas fan running till the valve replacement activity is completed.
        17. Ensure proper locking of counter weight before dismantling valve operating structure.
        18. Only 5 T capacity wire rope slings are to be used for lifting the valve operating structure with counter weight.
        19. Then remove valve with the help of crane with the same arrangement as above.
        20. Lower old Burner Valve and then lift the new valve by crane.
        21. Place the valve and put bolts on both sides on the lower half.
        22. Then place spiral gaskets carefully on stove side and tighten the flange bolts.
        23. Fix the spiral gasket on gas duct side and tighten the bolts.
        24. Tighten the flange bolts thoroughly and give water connections for the valve.
        25. Check the water flow through the outlet pipe
        26. Connect the hoses and also ask instrumentation to connect the limits.
        27. Connect the Hydraulic hoses of Hot Blast valve, cold blast valve, Cold blast Bypass valve respectively as per tagging.
        28. Open the shutoff valves in the hydraulic power pack.
        29. Take trial and set valve for full opening and closing
        30. Again, reduce the wind, such that HBS BF gas main shut off and goggle valves can be closed
        31. Purge the HBS BF gas main header with N2, remove the dummy plate from gas shutoff valve and fasten the valve thoroughly with new gasket.

Clear the electrical shut down & work permit, give clearance to operation people.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Sr No** | **Description** | **Min stroke length (MM)** | **Max stroke length (MM)** | **Present Stroke length (MM)** | **Bonnet top to disc stem top as per drawing (MM)** |
| 1 | Hot blast valve#1 | **1170** | 1280 | 1280 | 817 |
| 2 | Hot blast valve#2 | **1170** | 1270 | 1255 | 817 |
| 3 | Hot blast valve#3 | **1170** | 1280 | 1280 | 817 |
| 4 | Burner valve#1 | **860** | 890 | 890 | 600 |
| 5 | Burner valve#2 | **860** | 920 | 905 | 600 |
| 6 | Burner valve#3 | **860** | 890 | 890 | 600 |
| 7 | Backdraft valve | **850** | 890 | 850 | 600 |
| 8 | Mixture shut off valve | **775** | 890 | 775 |  |

Note: For BURNER VALVE

Bonnet mounting flange to disc top distance to be maintained is 600

As show in below diagram.



BURNER VALVE

1. ***Valve changing BACK DRAUGHT VALVE***
2. Furnace shut down is required for changing of this valve
3. 100T Crane to be used
4. Take work permit from production for changing of valve.
5. Ensure that the stove is isolated and withdrawn from PLC auto mode.
6. Close the hydraulic power pack stand shutoff valve of respective stove valve and also the main shut off valve of the stand and apply mechanical LOTO – Resp- Mechanical engineer.
7. Take Electrical shutdown of hydraulic powerpack from electrical engineer.
8. Close cooling water valves of back draught valve and start removing the hoses of disc & body jacket.
9. Ask electrical department to remove the limit switches.
10. Remove hydraulic hoses, mark the direction on the hoses for opening and closing and also put plug for the hoses.
11. Collect the oil in the oil can while opening the hoses.
12. Then remove valve with the help of crane.
13. Use proper slings for lifting the valve.
14. Lower old Back Draught Valve and then lift the new valve by crane.
15. Place the valve and put bolts on both sides on the lower half.
16. Fix the spiral gasket on furnace side and tighten the bolts.
17. Then place gasket carefully on the other side and loosen the tie rods and then tighten the flange bolts.
18. Tighten the flange bolts fully and give water connecting for the valve.
19. Check the water flow through the outlet pipe
20. Connect the hoses and also ask the electrical to give limit. Clear electrical isolator shutdown.
21. Open the shutoff valves in the hydraulic power pack.
22. Take trial and set valve for full opening and closing.
23. ***Valve changing CHIMNEY BYPASS VALVE***
24. While changing Chimney Bypass Valve, ensure that work should be stopped when stove is depressurized. Ask production to communicate.
25. Take work permit from production for changing of valve.
26. Ensure that the stove is isolated and withdrawn from PLC auto mode.
27. Close the hydraulic powerpack stand shutoff valve of respective stove valve and also the main shut off valve of the stand & LOTO – Resp- Mechanical engineer.
28. Ensure that the GSV is close.
29. Ask electrical/instrumentation department to remove the limit switches.
30. Remove hydraulic hoses, mark the direction on the hoses for opening and closing and also put plug for the hoses.
31. Collect the oil in the oil can while opening the hoses.
32. Then remove valve with the help of hydra (12T)
33. Remove old gaskets and clean the flanges
34. Shift old removed valve at side and fix the new/overhauled tested valve. Check the flow direction arrow.
35. Place new gasket on chimney duct side tighten the bolts fully and then place gasket on stove side and tighten the bolts fully.
36. connect the hoses
37. Take trials, set the limit switches and give clearance
38. ***Regulating valve (GRV) changing***
39. Furnace shut down is required for changing of this valve
40. GSV should be fully closed
41. Ensure that the stove is isolated and withdrawn from PLC auto mode.
42. ~~Steam purge the gas line.~~ N2 purging to be done.
43. Take Electrical and Instrumentation shutdown from electrical/ Instrumentation engineer.
44. Take work permit from production for changing of valve.
45. ~~Select PLC in Local mode.~~
46. Remove the all connections of the actuator (Resp. Electrical dept).
47. Remove Bolts of the flanges and keep them properly.
48. Remove valve by slinging it properly to lifting lugs with the help of chain blocks (1-2T capacity).
49. Shift old removed valve at side and fix the new/overhauled tested valve. Check the flow direction arrow, valve position (open/close) & mark on the pointer on outer body.
50. Insert gasket at both the flanges and tighten the bolts.
51. Ensure valve position by checking the disc and pointer.
52. Take trial by manual operation of the valve.
53. Give electrical connection to the actuator, take trial and set the open and close limit switch.
54. Give clearance to the production and normalize local permission in control room.
55. ***Regulating valve (CARV) changing***
    1. Furnace shut down is required for changing of this valve
    2. Take shut down of both the CA fans
    3. CASV should be fully closed
    4. Ensure that the stove is isolated and withdrawn from PLC auto mode.
    5. Take Electrical and Instrumentation shutdown from electrical/ Instrumentation engineer.
    6. Take work permit from production for changing of valve.
    7. ~~Select PLC in Local mode.~~
    8. Remove the all connections of the actuator (Resp. Electrical dept).
    9. Remove Bolts of the flanges and keep them properly.
    10. Remove valve by slinging it properly to lifting lugs with the help of chain blocks (1-2T capacity).
    11. Shift old removed valve at side and fix the new/overhauled tested valve. Check the flow direction arrow, valve position (open/close) & mark on the pointer on outer body.
    12. Insert gasket at both the flanges and tighten the bolts.
    13. Ensure valve position by checking the disc and pointer.
    14. Take trial by manual operation of the valve.
    15. Give electrical connection to the actuator, take trial and set the open and close limit switch.
    16. Give clearance to the production and normalize local permission in control room.
56. ***Regulating valve (Mixing Blast RV) changing***
57. Furnace shut down is required for changing of this valve
58. Ensure that all the stoves are isolated and withdrawn from PLC auto mode.

c) Take Electrical and Instrumentation shutdown from electrical/ Instrumentation engineer.

1. Take work permit from production for changing of valve.
2. Select PLC in Local mode.
3. Back Draught valve has to be in open condition
4. Take shut down of main motors of both the blowers
5. Remove the all connections of the actuator (Resp. Electrical dept).
6. Remove Bolts of the flanges and keep them properly.
7. Remove valve by slinging it properly to lifting lugs with the help of chain blocks (1-2T capacity).
8. Shift old removed valve at side and fix the new/overhauled tested valve. Check the flow direction arrow, valve position (open/close) & mark on the pointer on outer body.
9. Insert gaskets at both the flanges and tighten the bolts.
10. Ensure valve position by checking the disc and pointer.
11. Take trial by manual operation of the valve.
12. Give electrical connection to the actuator, take trial and set the open and close limit switch.
13. Clear the shutdown of main motors of both blowers
14. Give clearance to the production and normalize local permission in control room.
15. ***Valve changing MIXING BLAST SHUT-OFF VALVE***

a) Furnace shut down is required for changing of this valve

b) 50T/100T Crane to be used

c) Take work permit from production for changing of valve.

d) Ensure that all the stoves is isolated and withdrawn from PLC auto mode.

e) Back Draught valve has to be in open condition

f) Take shut down of main motors of both the blowers

g) Close the hydraulic power pack stand shutoff valve of respective stove valve and also the main shut off valve of the stand and apply mechanical LOTO – Resp- Mechanical engineer.

h) Take Electrical Isolator shutdown from electrical engineer

1. Close cooling water valves of mixing blast shut-off valve and start removing the hoses of disc & body jacket.
2. Ask electrical department to remove the limit switches.
3. Remove hydraulic hoses, mark the direction on the hoses for opening and closing and also put plug for the hoses.
4. Collect the oil in the oil can while opening the hoses.
5. Then remove valve with the help of crane.
6. Use proper slings for lifting the valve.
7. Lower old Mixing Shut-off Valve and then lift the new valve by crane.
8. Place the valve and put bolts on both sides on the lower half.
9. Fix the spiral gasket on furnace side and tighten the bolts.
10. Then place gasket carefully on the other side and then tighten the flange bolts.
11. Tighten the flange bolts fully and give water connections for the valve.
12. Check the water flow through the outlet pipe
13. Connect the hoses and also ask the electrical to give limit. Clear electrical isolator shutdown.
14. Open the shutoff valves in the hydraulic power pack.
15. Take trial and set valve for full opening and closing.
16. Clear the shutdown of main motors of both blowers
17. Give clearance to production & normalize the local mode of PLC

# *Regulating Valves (Gas, Air & Mixing) actuator changing*

1. Inform the production engineer and take work permit.
2. Take electrical shutdown and ask them to disconnect the cables.
3. Decouple & remove the actuator and replace it with new/checked and tagged unit.
4. Clear electrical shutdown and take trial.
5. If required, set the valve for full opening and full closing.
6. Clear work permit and give clearance.
7. Handle the actuator carefully.
8. Do not use hand soaked with grease and oil.

# Work No 3: Hydraulic cylinder changing

1. Take work permit from production for changing of cylinder.
2. Ensure that the stove is isolated and withdrawn from PLC auto mode.
3. Close the hydraulic power pack stand shutoff valve of respective stove valve and also the main shut off valve of the stand and apply mechanical LOTO – Resp- Mechanical engineer.
4. Remove hydraulic hoses, mark the direction on the hoses and put plug for the hoses.
5. Remove the pin of cylinder connecting valve.
6. Remove end trunnion flanges (in case of trunnion mounted cylinders, i.e. of Cold Blast Valve & Chimney Valve), or bolts of end flange (in case of cylinders having end flange), and change the cylinder with new/tested & tagged cylinder.
7. Give hose pipe connections to the cylinder. Care to be taken to remove the air which will be entrapped in the hoses & pipeline
8. Open the valves of from hydraulic stand.
9. Clear the electrical isolator shutdown.
10. Take trial and check for valve full opening and closing by requesting control room in charge.
11. Clear the work permit
12. **NOTE:** INCASE OF BURNER VALVE, HOT BLAST VALVE, BACK DRAUGHT VALVE & MIXING VALVE, COUNTER WEIGHT HAS TO BE LOCKED FIRMLY IN TOP POSITION (I.E. VALVE CLOSED POSITION) BEFORE STARTING THE JOB OF CYLINDER REMOVAL

**Work No 4: Valve hydraulic hose changing**

1. Take work permit and get production clearance.
2. Close the hydraulic power pack stand shutoff valve of respective stove valve and also the main shut off valve of the stand and apply mechanical LOTO – Resp- Mechanical engineer.
3. Remove the hose and collect the spilled oil in the pan.
4. Fit the new clean hose and open the corresponding hose.
5. Take trial check for the oil leakage and clear the work permit.

**Work No 5: Valve hydraulic oil leakage arresting**

1. Tighten the fittings or change the necessary O- ring, dowty seal.
2. Follow hose changing procedure.

**Work No 6: Hose changing (Water)**

**If outlet hose is puncture**:

1. Take work permit and get production clearance.
2. Open the HBV and close the corresponding valve of hydraulic valve stand.
3. Reduce the water flow of the valve and change the hose.
4. Open the valve from hydraulic stand and also increase the flow fully.
5. Take trial and give clearance

**If inlet hose is having puncture**:

1. Take shutdown of furnace.
2. Take work permit and get production clearance.
3. Open the HBV and close the corresponding valve of hydraulic valve stand.
4. Loosen the threads of the hose near valve end.
5. Give temporary water connection from spare valves provided.
6. Remove the other end of hose and connect the new hose at same joint.
7. Open the water line slightly and remove temporary water connection and connect the new hose.
8. Tighten the hose swivel nut and open the valve fully.
9. Open the valve from hydraulic stand.
10. Take trial and give clearance.

**Work No 7: Valve lubrication**

1. Lubrication of valves to be done once in 15 days
2. Take Co monitor
3. Take work permit and inform production.
4. Pump grease inside the valve.
5. Collect the scrap grease and keep it in correct container
6. Care should be taken not to keep hands or feet on the valve body.
7. Do not wear loose clothes.
8. Stay away from valves and follow sequence before greasing.

**Work No 8: Valve cleaning**

1. Clean the valve with the help of compress air.
2. Should wear goggles while cleaning.

# Work No 9: Valve flanges leakage arresting

1. Check if the bolts are loose. Tighten if required.
2. If still leakage is not stopping follow the valve changing procedure and change the gasket.

# Work No 10: Hydraulic pipeline painting

1. Take work permit and inform production about the job.
2. Always keep CO detector to monitor the Co gas level.
3. Clean the pipes and start painting.

**Work No 11: Counter weight adjusting and chain/rope changing for HBV, Back Draught, Burner & Mixing Blast Shut Off valve**

1. Take work permit and production clearance.
2. Close the valves from hydraulic stand
3. Withdraw from PLC mode
4. Close the required valve fully and give packing of counter wt.
5. Lock the valve for safety purpose.
6. Close the hydraulic valves from stand
7. Adjust the chain/rope of counter wt or change the rope/chain of counter wt.
8. Open the valve from hydraulic stand.
9. Close the valve and remove the packing.
10. Take trial and check if counter wt is fouling anywhere and give clearance.

**Work No 12: Sizes & Weights of different valves**

To be checked every week

Following are the sizes & weights of different valves in HBS:

| Description | Wt.of valve (kg) | Description | Wt of valve (kg) |
| --- | --- | --- | --- |
| Hot Blast valve DN1000 | 8500 | Combustion Air Regulating Valve DN700 | 200 |
| Burner Valve DN700 | 4500 | Gas Regulating Valve DN700 | 200 |
| Cold Blast Valve DN900 | 1300 | Combustion Air Shut Off Valve DN700 | 400 |
| Cold Blast Bypass Valve DN250 | 400 | Gas Sut Off Valve DN700 | 400 |
| Chimney Valve DN1500 | 2500 | Back Draught Valve DN700 | 4500 |
| Chimney Bypass valve DN300 | 500 | Mixing Blast Shut Off Valve DN700 | 3000 |
| Manual Bleeder Valves DN150 | 150 | Mixing Blast Regulating Valve DN600 | 200 |

Use proper slings while dismantling and erection based on weight

**Work No 13: CA Fan bearing/bearing block changing**

1. Take clearance from production before starting of work
2. Take shut down of the required CA Fan
3. Discharge valve of the CA fan has to be closed & electrical isolation to be done.
4. Take work permit from production
5. Decouple the fan from motor
6. Remove the damper from the suction side
7. Remove the impeller casing front cover (blower side)
8. Remove the impeller lock nut
9. Remove the impeller safely from the shaft by using proper tools & tackles by using hydra with proper slings & d-shackles
10. Remove the impeller casing back cover (stock house side)
11. Remove the nuts of foundation bolts & lift the bearing block slowly by hydra with proper slings & d-shackles
12. Shift the bearing block to a safe working place and change the bearings (if bearings are required to be changed)
13. If the bearing block has to be replaced, then shift the new/overhauled bearing block by hydra to the required position (in between motor & impeller), and safely lower the same on its foundation bolts
14. Tighten the nuts of foundation bolts
15. Fix back the impeller
16. Tighten the lock nut of the impeller
17. Fix back both the back as well as front covers of the casing & tighten its bolts
18. Fix back the removed suction side damper
19. Check the alignment & do the alignment if required
20. Couple back the bearing block with motor
21. Clear the electrical shut down and take trials
22. Clear the work permit and give clearance to production

**Work No 14: CA Fan impeller changing**

1. Take clearance from production before starting of work
2. Take shut down of the required CA Fan
3. Discharge valve of the CA fan has to be closed & electrical isolation to be done.
4. Take work permit from production
5. Remove the damper from the suction side
6. Remove the impeller casing front cover (blower side)
7. Remove the impeller lock nut
8. Remove the impeller safely from the shaft by using proper tools & tackles by using hydra with proper slings & d-shackles
9. Shift the impeller to some safe place
10. New/overhauled impeller to be shifted to the required position and fixed on the shaft
11. Tighten the lock nut of the impeller
12. Fix back the front cover of the casing & tighten its bolts
13. Fix back the removed suction side damper
14. Clear the electrical shut down and take trials
15. Clear the work permit and give clearance to production

**Work No 15: CA Fan coupling bush replacement**

1. Take clearance from production before starting of work
2. Take shut down of the required CA Fan
3. Discharge valve of the CA fan has to be closed & electrical isolation to be done.
4. Take work permit from production
5. Replace the coupling bushes wherever required (damaged)
6. Check & tighten all the coupling bolts
7. Clear the electrical shut down and take trials
8. Clear the work permit and give clearance to production

**Work no 16 : Hot blast main expansion bellow enveloping**

1. **Preparatory jobs**
2. Working platform to be erected at GCP side & bottom of expansion bellow.
3. Welding machines 3 Nos, Gas cutting set & TIG welding sets are be arranged at site.
4. Prepare the expansion bellow half’s welding it with flanges as per drawing provided.
5. Furnace shutdown is required for this activity.
6. Obtain work permit from BF control Room.
7. Ensure Back draft valve in open condition & all hot blast valves in closed condition. And take electrical shutdown of HBS hydraulic power pack pump, and isolate individual hydraulic valve stands.
8. Person climbing to the extended platforms should wear safety belts and anchor to adjacent structures at all times.
9. Gas cut and remove the platform present over top of hot blast main line expansion bellow. Hard barricade the walkway on both the sides
10. Wrap the existing leaking bellow with Ceramic wool insulation. Hot blast main pipe is very hot. Cover the pipe with asbestos cloth to prevent direct contact. Person doing the job should wear heat resistant hand gloves.
11. 25T crane to be used for erection of bellow.
12. Sling the bellow half with flange to the crane hook and lift to the position.
13. Matching and aligning the segments of jacketed bellow and tacking with electric arc welding to the duct.
14. Complete the Long seam welding (two) half’s of the Bellow with Flange rings in place using TIG machine.
15. Full Arc welding of the Flange rings from outside only. 2 runs of welding to be carried out
16. External welding of Lugs and Gussets and insertion of 4 Limit rods with its nuts (5 nos. per Limit rods)
17. Check the entire Welded area for Leaks using DP test.
18. Fix back the dismantled platform.
19. Normalise all the hydraulic & electrical isolations and clear the work permit & handover to production Dept.

**Work no 17: Hot blast valve rope/gasket replacement (Stove Side)**

1. Ensure that the stove is isolated and withdrawn from PLC auto mode.
2. Take work permit from production Shift Superintend for changing rope or gasket of hot blast valve STOVE SIDE.
3. Ensure all the valves are CLOSED except chimney & gas line bleeder valve (remain OPEN)
4. Take electrical shutdown of GSV, ASV and put LOTO V
5. Close the hydraulic power pack stand shutoff valves of respective stove and also the main shut off valve of the stand and put mechanical LOTO V.
6. Ensure HBV of respective stove is fully closed through proximity switch & its striker position. And hydraulic cylinder stroke length.
7. Lock counter weight mass with drive carriage base (use ISMC 100) by welding
8. Remove hydraulic hoses of respective HBV and loop the hoses
9. Ensure there is no blast leakage through closed HBV from Hot Blast Main side of the respective stove. If any blast leakage found the same will be appeared from chimney valve. So chimney valve bottom flanged to be opened carefully to ensure no blast leakage.
10. IF BLAST LEAKAGE FOUND (FROM HBM TO HBS SIDE) FURNACE SHUTDOWN IS REQUIRED TO ATTEND THE JOB.
11. Ensure temperature at working area is permissible.
12. Provide hydraulic jack support to bottom of the HBV so that it will not sag after removal of flange bolts. (Before putting hydraulic jack support to HBV ensure bottom platform is able take the load. Otherwise place beam (ISMB 250 x 6 mtr length) and place hydraulic jack on it.)
13. Remove MS strip by gas cutting.
14. Keep 4 nos bolts at 12, 3, 6 & 9 O’clock position and rest are removed from flanges.
15. Generate gap by tighten tie rods of stove side compensator
16. Clean the surface of flanges
17. Insert a layer of glass wool between the flanges for avoiding heat radiation and rope life
18. Insert 3 rounds style 123 dia 12 mm ceramic rope
19. Place all the bolts and nuts (M30 x 160 mm x 44 nos )
20. Hand tight all the nut & bolt
21. Loosen tie rods of stove side compensator
22. Start tightening the bolts with torque wrench
23. Removed hydraulic jack from bottom of the valve
24. Do housekeeping
25. Remove locking support from HBV counter weight
26. Connect hydraulic hoses with hydraulic cylinder
27. Remove mechanical LOTO V from the power pack
28. Clear electrical shutdown
29. Clear work permit
30. Handed over the stove to production
31. Bolt retighten to be done after 1 operation cycle.

**Work No 18 : Inspection and Maintenance of Chimney valve by**

**Opening bottom flange.**

1. This activity is to be carried during running of furnace.
2. Take production clearance and work permit for performing the above activity.
3. Depressurize and isolate the stove of respective stove in which bottom inspection flange of chimney valve to be opened.
4. While performing the activity one stove will in blast and its chimney & chimney bypass valve to be hydraulically isolated & solenoid connection to be removed.
5. Other two stoves to be depressurized & kept in maintenance mode with chimney valve in close position & its hydraulic line shutoff valve to be closed.
6. Ensure Solenoid connection of Cold blast, burner, chimney & chimney bypass valve of respective stove on which maintenance activity to be carried out is disconnected.
7. Partly loosen the bottom flange bolts & ensure that **CO** is zero.
8. Remove the bottom flange & keep it at a safe place.
9. Check **CO** level inside the valve. Alternatively, this can be done by tying the **CO** monitor to the long rod/attachment and positioning it inside the valve.
10. Use air mask & jeans clothing while doing inspection & maintenance.
11. Inspect the valve internals with the help of led torch & carry out maintenance activity.
12. Close the inspection door.
13. Take Hydraulic circuit in line.
14. Take trials & clear the work permit.

**Work No 19 : Grouting points welding.**

This activity is to be carried during running of furnace.

1. Take production clearance and Hot work permit for performing the above activity.
2. Depressurize and isolate the respective stove in which grouting activity to be carried out
3. Take mechanical isolation of respective stove by keeping chimney valve in open condition & all other valves in close condition.
4. Gas cut the shell where grouting is required as shown by user department.
5. Weld the grouting socket with valve & ensure valve is close after completion of welding work.
6. Take hydraulic circuit in line & clear the work permit.

**Work No 20 : Hot blast valve expansion bellow enveloping.**

1. Preparatory jobs
   * 1. Welding machines 3nos, gas cutting set & TIG welding sets are to be arranged at site.
2. Obtain work permit from BF control room.
3. This activity to be carried out during furnace running.
4. Dismantle the present bellow tie rods & weld the gap.
5. Wrap existing bellow with ceramic wool insulation
6. Position the bellow half over the existing bellow
7. Match the two half of bellows on existing flange & tag weld
8. Complete the long seam welding of two half of bellows over existing flanges using TIG machine.
9. External welding of Lugs and Gussets and insertion of 4 Limit rods with its nuts (5 nos. per Limit rods)
10. Check the entire Welded area for Leaks using DP test.
11. Clear the work permit & handover to production Dept.
12. Rotate people to carry out welding activity.
13. Water/ORS to be provided to working team.

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**APH BYPASS LINE INSTALLATION**

1. Take work permit from operation Dept.
2. Take electrical s/d of HBS main goggle valve by LOTO procedure.
3. All chimney & Chimney by pass v/v to be close & do mechanical isolation
4. Open man hole of west gas main towards stove no 1
5. Gas cut the chimney main duct around 800x800 on both the end of bypass line.
6. After castable breaking cut the remaining duct in 4 parts.
7. Weld the cut portion (manhole) of bypass line, before welding manhole ensure proper housekeeping inside the bypass duct.
8. Gas cut the chimney main duct on both end of APH as per the marking (Approx. 200mm).
9. Insert the blank plate & weld it both side towards duct end.
10. Clear the electrical s/d & take hydraulic circuit in line.
11. Clear the work permit

**Work No 21 : Hot blast line expansion bellow replacement**

1. Before starting the job ensure header duct temperature is within permissible limits of working (i.e. less than 45degrees)
2. Furnace shutdown is required for this activity.
3. Obtain work permit from BF control Room.
4. Ensure Back draft valve in open condition & all hot blast valves in closed condition. And take electrical shutdown of HBS hydraulic power pack pump, and isolate individual hydraulic valve stands & take mechanical isolation
5. Person climbing to the extended platforms should wear safety belts and anchor to adjacent structures at all times.
6. Gas cut and remove the platform present over top of hot blast main line expansion bellow. Hard barricade the walkway on both the sides
7. Using wire rope slings support the bellow with the help 100T crane
8. Remove one side flange bolts & compressed the bellow by 50MM to create a gap.
9. Remove the other side bolts & sling the bellow with the help of 100T crane.
10. ~~Gas cut the header area besides bellow on either side and slowly lift the bellow with the 100T crane.~~
11. Get the removed bellow to ground level.
12. ~~Sling the new Bellow along with duct attached on both end (~~**~~while fitting duct to bellow put dummy gasket pieces on four sides of flanges to create a gap for inserting main gaskets & tightened the bolts~~**~~) and lift it to the position with the help of the 100T crane.~~
13. ~~Position the new bellow in the Hot Blast Header and tag weld on both sides. (While fixing ensure the flow direction of bellow)~~
14. Sling the new bellow & lift it to the position with 100T crane, ensure bellow is compressed to fit in position easily. ( Flow direction to be ensured before installation)
15. Install one side gasket & tight the bolts, insert other side gasket & bolts. Loose the bellow tie rods & tight the bolts. Make sure both side bolts are fully tightened.
16. ~~Ensure the bellow position is in alignment with the header before welding, after the position is ensured welding to be done on either side.~~
17. ~~Remove the bellow by slinging with the help of 100T crane & position it safely on ground for refractory lining.~~
18. ~~After refractory work install new bellow, insert one side gasket by tightening bellow tie rods, tightened the flange bolts & insert other end gasket & tighten the flange, make sure both end bolts are fully tightened.~~
19. Check the entire Welded area for Leaks using DP test.
20. Fix back the dismantled platform.
21. Normalise all the hydraulic & electrical isolations and clear the work permit & handover to production Dept.

**Work No 22 : Balancing of HBS CA FAN**

1. Take clearance from operation for working on HBS CA FAN.
2. Take electrical shut done of HBS CA FAN main motor, Discharge valve & Inlet damper (100% close position).
3. Take work permit from operational in charge for CA fan balancing work (**VL/IMS/PID2/BF3/WI/15**)
4. Before starting the work, fan should be in stand still state. No external devise to be used to stop the fan to zero state.
5. Once fan achieves zero state open the side cover of casing.
6. Remove coupling guard & paste reflective stickers/tape and position sensor to capture rotation.
7. Weld excitation/test/correction mass as per instruction by CBM expert.
8. Close the casing cover.
9. Clear the S/D of CA fan & give clearance to start the fan.
10. Once fan started only 1 person along with CBM engineer will go to capture vibration readings under closedsupervision of Engineer.
11. After capturing vibration readings stop Main ID Fan.
12. Take shutdown of Main ID Fan & wait till the impeller comes stand still
13. After vibration analysis open the casing door & Weld correction mass as per CBM expert & close the casing door.
14. Clear the electrical shutdown fan and take trials as per above procedure if vibration readings are satisfactory then take shutdown of fan.
15. Weld the piece fully and close the door.
16. If vibration readings were not satisfactory, then 2/3 more trials to taken as per CBM report.
17. Normalize the system, ensure all the safety guards are in place and release all equipment shutdowns and close the work permit.
18. Refer work procedure [WI/MAINT/12](WIMAINT12%20MATERIAL%20HANDLING%20.doc) for handling valves and filter.
19. Welding procedure as per SP 44
20. Please refer WI/MAINT/94 for fabrication, erection and dismantling
21. Use certified cutting torch set.
22. Use certified slings, D-shackles, Grinding M/c, etc.
23. Do not stand below the load when it is hoisted.
24. Use all PPE-s
25. Use proper tools like spanners.

**DO :**

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* Take CO detector and monitor the CO level continuously while working on valves and gas line
* Continuous monitoring of co & o2 level
* Rotation of manpower
* Return back all scrap to store.
* Use 24v lamp inside the working area

**DO NOT**

* Keep Cutting set hoses haphazardly on walkway.
* Do not smoke, or use gas cutting torch and welding inside the bag house. This can cause fire hazard in the bag house.

**Amendement Record**

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| **Date** | **Manual Section Ref. & Para** | **Brief details of Revision** | **New Rev.** |
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