**WORK INSTRUCTIONS FOR** **BLAST FURNACE GAS CLEANING SYSTEM**

**Responsibility: Control Room Engineer**

**Identified Hazards:**

1. BF Gas Poisoning
2. Fire and Explosion in the gas line
3. Contact with hot water while cleaning the underground GCS tunnel
4. Sprain while bypassing slag granulation
5. Fall of person
6. Nonuse of PPE
7. Improper house keeping
8. Not carrying CO detector
9. Burns due to contact with hot water/surface
10. Mild explosion inside GCS during furnace shutdown
11. Dust generation
12. Inadequate local lighting
13. Dumping flue dust at ground
14. Ignoring person around the dust catcher before dumping the flue dust
15. Dust inhalation
16. contact with fire while welding
17. Human behaviour- Not following work instructions

**Significant Aspects:**

1. Usage of water
2. BF Gas leakage
3. Fire &Explosion
   1. Ensure minimum 600-800 mmwc pressure drop across ventury-1 and 1000-1200 mmwc across ventury-2 for effective cleaning of the gas.
   2. Also ensure water flow is maintained 43-46 M3/hr and 37-40m3/hr for Venturi-2 and Venturi-1 respectively.

**Dust catcher Dumping/Discharging**

**Responsibility: Furnace Incharge.**

**Identified Hazards:**

1. BF Gas poisoning
2. Fall of a person while cleaning dust catcher

**Significant Aspects**

1. BF gas leakage

2. Usage of water

3. Dust generation

**Procedure:**

1. Going to the dust catcher area is strictly prohibited when there is a gas leakage.
2. Ensure no personnel moving around the dust catcher area at the time of opening dust

Catcher.

1. Ensure that the dust catcher entry gates are closed.

**For BF1:**

1. Open the upper bell and close it after 2 minutes.
2. Open the bottom gate and close immediately at the first sign of blowing, repeat the activity till dust catcher gets dry

**For BF2:**

5. Open the upper bell and close it after 2 minutes.

~~6. Than start the dust suppression system which consist of following parts. (~~Not in use)

High pressure pump

Filters

Low pressure pump

~~Starting of dust suppression system is as follows:~~

* ~~Open valve of inlet water line connected to low pressure pump.~~ (not in use)
* ~~Release the push button from panel provided inside the shed made for dust suppression pumps.~~ (not in use)
* ~~Than rotate the main to ON position~~.(not in use)
* ~~Than start low pressure pump with switch provided.~~ (not in use)
* ~~Than start high pressure pump.~~ (not in use)

~~After starting the high pressure pump, dust suppression system will be in line.~~ (not in use)

7. Open the bottom gate and close immediately at the first sign of blowing, repeat the activity till dust catcher gets dry.

8. Once dust catcher gets dry, close the bottom gate.

~~9. Follow the reverse sequence for stopping dust suppression system, i.e. stop high pressure pump, then stop low pressure pump, rotate main to OFF position, press push button and then close valve of inlet water line.~~ (not in use)

10. Gas leakages if any should be arrested after taking furnace shutdown as per the shutdown WI.

11. Operators who are performing the above activity should wear dust mask in case he has to go near the dust catcher to arrest any gas leakages.

12. Dust has to be unloaded on ground ensuring no personal is working near dust catcher area.

13. After unloading on ground, should inform Raw Material to lift the dust.

14. Unauthorized operation or repair of any equipment is a punishable offence.

**GCS RECIRCULATION**

**Responsibility: Engineer -Gen. Shift /PCM Engineer**

**Identified Hazards:**

* 1. Fall of person

**Significant Aspects:**

* + 1. Usage of water

1. Unauthorized operation or repair of any equipment is a punishable offence.
2. Ensure proper recirculation of water without overflow of settling tanks by periodic

Cleaning.

1. Ensure that the thickener entry gate is locked, while not in use.
2. GCS settling ponds to be cleaned at least once in a week.
3. Flocculent addition to GCS water to be checked once in a shift, tank should be filled

Once in a day in general shift.

1. Water samples from thickener are to be collected on daily basis and analyzed for

suspended solids. (inlet & outlet)

1. Ensure that the O.D.S (VASA) pump is running in auto mode.
2. Thickener rake should be kept running all the time & should be lowered to maximum.
3. The people responsible for the above activity should monitor the thickner plant

Operation & abnormality should be immediately brought to the notice of the concerned personnel.

1. Ensure continuous flaring of Flare Stack of both furnaces.

**SAFE HANDING OVER OF GAS CLEANING SYSTEM**

**(Dust catcher, saturator, ventury& cyclone for gas cutting or welding job)**

**Responsibility: Shift Incharge**

**Identified Hazards:**

1. Fire & Explosion
2. Gas leakage
3. Fall of material from height
4. Fall of person from height
5. **Contact with fire while welding**

**Significant Aspects:**

1. Fire & Explosion
2. Gas leakage

1. No personnel is allowed to go near the hatch immediately

2. Ensure furnace top fire to be uniformly lit over the cross section.

1. Start steam purging at main line and ensure 5kg pressure at steam header during

purging.

1. Open the saturator top relief valve and wait for steam to come out and continue this for half an hour.
2. Ensure that the saturator is water sealed
3. Open the drain valve below ventury –2 for air purging
4. Drain the cyclone drip pot and keep the valve open (This is done for purging the line

with air to dilute gas pockets if any)

1. Open all the drip pot drain valve in the system for air purging
2. Open all the inspection doors in the gas line, open the bell & bottom gate of dust catcher.
3. Stop the cleaning job in dust catcher when there is a cutting/welding jobs on the gas line.
4. Handover the system to maintenance dept. after signing the work permit
5. Unauthorized operation or repair of any equipment is a punishable offence.

**Procedure for Saturator drip pot flushing**

**Responsibility: Furnace Incharge**

**Identified Hazards:**

1. Contact with blast furnace gas
2. Contact with hot water
3. Contact with hot shell
4. Falling of water from saturator top
5. Mechanical impact

**Significant Aspects:**

1. Gas leakage
2. Uses of water
3. Slurry generation
4. Unauthorized operation or repair of any equipment is a punishable offence.
5. Ensure that the personnel involved in the activity should use safety appliances viz.

Safety shoes, hand gloves, safety goggle, CO detector & not going alone.

1. Ensure that all personnel involved in the activity are trained in safety awareness
2. Ensure furnace is not hanging before doing flushing activity
3. Maintain a safe distance from the saturator drip pot shell.
4. Open the drip pot valve with steel handle & also ensure that the freshwater valves on the drip pot are kept open before flushing, continuously monitor the CO presence at the area.
5. Ensure drip pot overflow is continuous during flushing of drip pot. to avoid breaking of seal due to less water head.
6. As soon as first sign of clean water observed from the saturator drip pot close the valve tightly & come out from the area.

**Procedure for working on bleeders**

**Responsibility: Shift In-charge**

**Identified Hazards:**

1 Mech falling /impact

2. Fall of material from height

1. Unauthorized operation or repair of any equipment is a punishable offence.
2. Ensure that the work permit has taken by the concerned for working on bleeders.
3. Ensure that EV- 1 is kept opened and then disabled by removing the fuses.
4. Ensure furnace top fire to be uniformly lit over the cross section. EV1 is kept open, before signing the work permit.
5. No Clearance should be given for working on bells, equalization valves, when the work on bleeder is in progress.
6. Stop the cleaning job in dust catcher, during bleeder trials or if one bleeder has to be kept close.
7. As soon as bleeder work is completed work permit should be cleared, so that other jobs can be started.
8. Blowpipe ~~can~~ can’t be removed when work is in progress, on bleeder.
9. While removing & fixing the tuyeres or tuyere coolers, jobs on bleeder should be kept suspended & people should be removed from bleeder platform.

**Arresting gas leakage from bleeder valve**

**Responsibility: Furnace Incharge**

**Identified Hazards:**

* 1. Mech Falling /impact

**Significant Aspect:**

**1.** Gas leakage

* 1. The furnace in charge should check the bleeders, whenever furnace slipping has taken place..
  2. If there is any gas leakage observed, the bleeder valve has to be opened and closed after reducing the wind volume to 12000 NM3/HR, B.Pr 0.25kg/cm2, after the clearance from the power plant.
  3. In case bleeder leakage cannot be arrested by opening and closing of the bleeder then furnace shutdown to be planned and check for the problem.
  4. The number of furnace slipping and subsequent bleeder leakage has to be entered in the furnace log sheet.
  5. Unauthorized operation or repair of any equipment is a punishable offence.

Flare stack Operation

# Responsibility: Cast House In charge/SS

# Identified Hazards:

1. BF Gas poisoning
2. Fall of person
3. Contact with hot surface

**Significant Aspect:**

1. Flue gas generation
2. Gas leakage

1. Excess gas from the ~~gas holder are~~ main gas line released through the flare stack.

2. If there is no flame, the unburnt BF gas will escape through the stack.

3. To prevent escaping of ~~unbrunt~~ unburnt BF gas , the following precautions should be taken

5. If there is **no flame indication** in BF1 or BF -2 control room the control room staff has to first reduce wind and inform the same to the Cast house in charge or the SS who in turn try to fire the flare stack immediately

~~6. In BF2 when the is no flame is noticed muffle furnace temperature to be raised by closing 100~~

~~NB & 40NB gas valves & air valves.~~

~~7. When the temperature reaches 750 deg cent., regulate 100NB,40NB & air valves till it flares.~~

8. Unauthorized operation or repair of any equipment is a punishable offence.

9~~. If required~~ LPG support to be kept continuously ON for healthiness for burner firing ~~ensuring continuous flaring~~.

**Working on Flarestack**

**Responsibility: Shift In charge**

**Identified Hazards:**

* 1. BF Gas poisoning
  2. Fall of person
  3. Contact with hot surface

**Significant Aspect:**

* + 1. Flue gas generation
    2. Gas leakage
    3. Use of Electrical energy

**BF1 Flare stack**

1. Unauthorized operation or repair of any equipment is a punishable offence.
2. Inform GEL control room regarding water sealing the flare stack line & inform BF2 to maintain line pressure. (800mmwc).
3. Water seal the flare stack main seal
4. Both seal of flare stack bypass gas line to be water sealed. (keep overflow)
5. Additional Seal on GEL gas line which is connected to flare stack Bypass gas line is to be water sealed
6. ~~Close 100NB & 40 NB gas valves & air valves~~.
7. Close the pneumatic flare stack valve and keep in manual mode.
8. Purge the line with steam. & Hand over to service dept.

**BF2 Flare stack**

* 1. Inform GEL control room and BF1 control room regarding water sealing the flare stack line. (to maintain line pressure580 ~ 650mmwc).
  2. Water seal the flare stack. (Keep overflow)
  3. ~~Close 100NB & 40 NB gas valves & air valves~~
  4. Purge the line with steam.
  5. Close the pneumatic valve, keep the valve in manual & hand over to service dept.
  6. Close the pneumatic flare stack valve and keep in manual mode.
  7. Purge the line with steam. & Hand over to service dept.
  8. Unauthorized operation or repair of any equipment is a punishable offence.

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| **Prepared By:**  Head – Production PID I | **Reviewed & Issued By:**  Management Representative | **Approved By:**  Head – Pig Iron Division |
| **Signature:** | **Signature:** | **Signature:** |
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| 12.07.2021 | Procedure for Blast furnace Gas cleaning system | Point no safe handing over gas cleaning system | 12 |
| 15.07.2022 | Procedure for Blast furnace Gas cleaning system | Dust catcher dumping/discharging  Flare stack operation | 13 |
| 30.08.2022 | Procedure for Blast furnace Gas cleaning system | New Hazard identified | 14 |