**SOP FOR**

1. **PURPOSE: Safe maintenance of de-dusting system for optimum**

**Performance.**

1. **SCOPE:** **PCM-Cast house and Stock house de-dusting system.**
2. **RESPONSIBILITY: Engineer In Charge & workmen at job**
3. **PROCEDURE: MAINTENANCE OF PCM-CH and STOCK HOUSE DEDUSTING SYSTEM.**

PPE –s to be used:

* Helmet, Safety shoes, Dust masks, Hand gloves and goggles, completely sealed goggles.

Work No 1 : Vane feeder replacement.

Work No 2 : Chain drive replacement and lubrication of scrapper.

Work No 3 : Purging valve replacement.

Work No 4 : Cylinder replacement.

Work No 5 : Inspection and replacement of bags.

Work No 6 : Drive replacement of bucket elevator.

Work No 7 : Drive replacement of scrapper conveyor.

Work No 8 : Replacement of scrapper links.

Work No 9 : Bearing replacement of ID fan

Work No 10 : Oil filling in fluid coupling.

Work No 11 : Back flushing of heat exchanger.

**Work No 12 : Balancing of SH/PCM DEDUSTING FAN**

Aspect – impact

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| --- | --- |
| Oil Spillage : | Land contamination & Resource Depletion. |
| Scrap generation :  Graphite dust emission : | Resource Depletion.  Environment pollution. |
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Hazards identified

Mechanical Hazard

1. Trapping between two objects.
2. Fall of material, equipment, hammer, tools, slinged items, bolts.
3. Fall of person from platform.
4. Entanglement in moving Scrapper link.
5. Impact of moving / slinged items.
6. Impact of pipe line while working near Purging valves.

Physical Hazard

1. Noise, pressure, temperature
2. Fall of dust/graphite in eyes / ear / body

Chemical hazard

1. Fire/explosion because of CO in PCM & CH de dusting.

Electrical hazard

1. Shock during welding

**Work No 1: Vane feeder replacement.**

1. Take clearance from control room in charge ~~by taking work permit.~~
2. Ensure that control room in charge has changed over the system into field mode & respective vane feeder is taken out form the loop.
3. Take electrical shut down by putting off isolators and locking with padlock LOTO.
4. Take work permit.
5. Close manual gate valve above vane feeder to avoid fall of dust/graphite.
6. Remove the mounting bolts & safely lower the old assembly and keep it aside at a safe distance so that the New Vane feeder can be shifted to location safely.
7. Refer WI/MAINT/12 for material handling.
8. Replace vane feeder with new/overhauled one, fully tighten the bolts.
9. Before coupling with motor rotate with hand and ensure it is freely rotating
10. Open the gate valve above the vane feeder.
11. Clear electrical shut down and take trial in manual mode along with electrical & operation dept.
12. Clear the work permit. Request control room in charge to revert the system back to Auto mode.

**Work No 2 : Chain replacement and lubrication of scrapper.**

1. Take clearance from control room in charge .~~by taking work permit.~~
2. Ensure that control room in charge has changed over the system into field mode.
3. Take electrical shut down by putting off isolators and locking with padlock LOTO.
4. Take work permit.
5. Remove the chain drive guard & keep it aside
6. Loosen the chain tensioning bolt.
7. Remove the old chain after disconnecting the master link & replace it with new one.
8. Ensure proper lubrication and greasing is done.
9. Tighten the chain tensioning bolt by visually checking the tension on chain.
10. Put back chain drive guard.
11. Clear electrical shut down and take trial along with electrical & operation dept.

Note: Incase only **lubrication** of chain needs to be done then:

* Follow steps A to D of Work no.2 & carry our greasing .
* Fix back the guard & clear electrical shutdown.
* Inform Control room in charge & clear the permit.

**Work No 3: Purging valve replacement.**

1. Take clearance from control room in charge.
2. Ensure that control room in charge has changed over the system into field mode.
3. Take electrical shut down by putting off isolators and locking with padlock LOTO.
4. Take work permit.
5. Close corresponding header by closing isolation valve and put the mechanical lock.
6. Slowly open the drain valve of same header to de pressurize the system .
7. Request Instrumentation to remove the solenoid coil .
8. Remove faulty valve and replace it with a new/overhauled one.
9. Ensure tightening of all the bolts.
10. Request Instrumentation to connect the solenoid coil.
11. Close the drain valve of header & Open main isolation valve of header by removing the mechanical lock .
12. Manually purge the valve and check proper functioning of purging valve .
13. Inform Control room in charge to change over the system to Auto mode.
14. Clear the work permit & give clearance.

**Work No 4: Cylinder replacement.**

**The same activity should be carried out in plant shutdown**

1. Take clearance from control room in charge
2. Ensure that control room in charge has changed over the system into field mode.
3. Take shut down of ID fan by putting off isolators and locking with padlock LOTO.
4. Take work permit.
5. Close the inlet valve of solenoid valve of cylinder to be replaced .
6. Open the manhole by removing the flange bolt on which cylinder is mounted.
7. Immediately fix another dummy plate in place of manhole to avoid any accidental fall into the open space.
8. Remove faulty cylinder and replace it with a new/overhauled one.
9. Now fit the manhole along with cylinder back to position after removing the dummy plate .
10. Ensure tightening all the bolts.
11. Open isolation valve of header .
12. Take trial of new cylinder.
13. Clear ID fan shutdown .
14. Inform Control room in charge to change over the system to Auto mode.
15. Clear the work permit & give clearance.

**Work No : Inspection and replacement of bags**.

1. Take clearance from control room in charge.
2. Ensure that control room in charge has changed over the system into field mode.
3. Take electrical shut down by putting off isolators and locking with padlock LOTO.
4. Take work permit.
5. Explain the hazards of Nitrogen and CO to concerned workmen while working on PCM de dusting.
6. Check Oxygen % before job is started, it should be ~~18 to~~ 19.5% to 23%.
7. Isolate corresponding chamber by closing cylinder.
8. Close the puffing valve of respective chamber of main header and put the mechanical lock.
9. Open the top cover by loosening bolts.
10. Remove purging header above bags by removing bolt and keep it aside.
11. Remove bag and replace it with a new one.
12. Fix back purging header and tighten the bolts.
13. Fix top cover and ensure tightening of bolts.
14. Open the puffing valve respective chamber of main header by removing the mechanical lock.
15. Take chamber in line by opening cylinder.
16. Inform production engineer about completion of work and clear work permit.

The above equipment is eliminated

**Work No 7 : Drive replacement of scrapper conveyor.**

1. Take clearance from control room in charge. ~~by taking work permit~~.
2. Ensure that control room in charge has changed over the system into field mode.
3. Electrical shutdown of particular scraper conveyor by loto.
4. Take work permit.
5. Remove Chain cover and remove the chain.
6. Remove foundation bolts, replace faulty drive with a new/overhauled one.
7. Fix chain and ensure proper tightness.
8. Ensure tightening all foundation belts, Put back chain cover and ensure all bolts fully tightened
9. Clear electrical shutdown and take trial.
10. Inform production engineer about completion of work and clear work permit.

**Work No 8: Replacement of scrapper links.**

1. Take clearance from production department
2. Take electrical shut down by putting off isolators and locking with padlock LOTO.
3. Take work permit.
4. Remove top cover of scrapper.
5. Identify the link to be replaced. Remove link by taking out connecting pin.
6. Replace it with new one.
7. Ensure proper fixing of split pin.
8. Fix back top cover and ensure tightening of all bolts.
9. Clear electrical shutdown and take trial.
10. Inform production engineer about completion of work and clear work permit.

**Work No 09 : Bearing replacement of ID fan .**

1. Take clearance from control room in charge.
2. Ensure that control room in charge has changed over the system into field mode.
3. Take electrical shut down by putting off isolators and locking with padlock LOTO.
4. Take work permit.
5. After Achieving Zero energy state , Remove the guards.
6. Decouple Hydraulic coupling and impeller shaft.
7. Isolate cooling line to Plummer blocks by closing valve and by removing the flange.
8. Drain oil from Plummer blocks. Follow WI/MAINT/93 for handling oil.
9. Remove top casing of ID fan.
10. Secure ID fan shaft and impeller with sling belts & hook it with hydra.
11. Remove top casing of Plummer block.
12. Lift ID fan shaft and impeller to desired workable height.
13. Place it on suitable stand & ensure it is firmly supported.
14. Remove coupling of drive side with help of puller and remove the bearing with the help of puller.
15. In case the NDE bearing has to be replaced then, impeller has to be removed .
16. Remove the lock nut of the impeller.
17. Fix the impeller puller for the hub of impeller
18. Remove the impeller with the help of puller and supporting the impeller with suitable supports.
19. Now remove the bearing with the help of puller.
20. First heat the new bearing (**22338)** in oil bath or on induction heater & ensure to continuously monitor the temp. as temp. should not exceed 85 deg cels.
21. Once temp. is achieved then slide the bearing on to the shaft ensure that shaft is cleaned and shaft bearing seating dimension.
22. Use proper hand gloves to handle hot objects.
23. Allow sufficient time to cool.
24. Now fit the impeller & drive side coupling.
25. Slowly insert the bearing into the Plummer block.
26. Tighten the cover of Plummer.
27. Fit back the impeller casing.
28. Fill oil in Plummer block.
29. Connect the water cooling line and open the valve.
30. Carry for necessary alignment of ~~blowe~~r fan shaft with fluid coupling output shaft. + - 5 divisions of dial gauge.
31. Check the final alignment reading and log it in Log book.
32. Put back the coupling guard.
33. Clear electrical shutdown & request Control room in charge to take trial.
34. Request shift engineer to monitor vibration readings twice in every shift for next 24 hrs. from start of ID fan~~.~~

**Work No 10 : Oil filling in fluid coupling.**

1. Take clearance from control room in charge
2. Take electrical shut down of ID fan by putting off isolators and locking with padlock LOTO.
3. Take work permit.
4. Remove oil filling cap and fill **T-46** oil up to marked oil level.
5. Put back oil cap
6. Clear electrical shut down.
7. Inform production engineer about completion of work and clear work permit.

**Work No 11 : Back flushing of heat exchanger.**

1. Take clearance from control room in charge.
2. Take electrical shut down of ID fan by putting off isolators and locking with padlock LOTO.
3. Take work permit.
4. Isolate heat exchanger by closing butterfly valve.
5. Remove oil IN/oil OUT and water IN/Water OUT flanges
6. Connect back flushing line to heat exchanger and allow back flushing.
7. Reconnect oil IN/oil OUT and water IN/Water OUT flanges.
8. Take heat exchanger in line by opening butterfly valve.
9. Clear electrical shut down.
10. Inform production engineer about completion of work and clear work permit.

**Work No 12 : Balancing of SH/PCM DEDUSTING FAN**

1. Take clearance from operation for working on DEDUSTING FAN.
2. Take electrical shut down of DEDUSTING FAN main motor, Discharge valve & Inlet damper (100% close position).
3. Take work permit from operational in charge for DD fan balancing work (**VL/IMS/PID2/BF3/WI/24**)
4. Before starting the work, fan should be in stand still state(Stationary 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 (Man Hole door of Fan Casing).
6. *PCM/S.H Dedusting Fan Casing inside temperature should be less than 45 degree Celsius.*
7. *CO Level should be 0 ppm (PCM/C.H dedusting), sufficient oxygen content (19.5% to 23 %).*
8. *Attendant must ensure proper illumination, if illumination not found ok, he must inform concern electrical person to provide hand lamp/Torch (24v).*
9. *Take the work permit from S.S, Safety dept. for entering inside Manhole door of casing.*
10. *The workmen (Entrant) who is trained and certified by SUB head and having valid confined space gate pass should perform the activity and he can be replaced (in emergency) only by certified entrant.*
11. *A standby (attendant) who is trained and certified by SUB head and having valid confined space gate pass should perform the activity and he can be replaced (in emergency) only by certified attendant.*
12. *Standby person who shall be positioned outside the confined space , must have no other duties other than monitoring people and conditions inside the confined space and coordinating with rescue personnel (he must have contact number of rescue team members) if required.*
13. *Standby (Attendant) person has to log down the entry details of all Entrants.*
14. After following Confined Space Procedure Ensuring all safety factors entering inside Manhole door of Casing .
15. Remove the Fan shaft Guard between bearing block & paste reflective stickers/tape and position sensor to capture rotation.
16. Weld excitation/test/correction mass as per instruction by CBM expert.
17. Close the Fan casing cover.
18. After normalcy of the System ,Clear the S/D of DD fan & give clearance to start the fan.
19. Once fan started only 1 person along with CBM engineer will go to capture vibration readings under closedsupervision of Engineer.
20. After capturing vibration readings stop Main ID Fan.
21. Take shutdown of Main ID Fan & wait till the impeller comes stand still (Stationery Position)
22. After vibration analysis open the casing door & Weld correction mass as per CBM expert & close the casing door.
23. Clear the electrical shutdown of fan and take trials as per above procedure if vibration readings are satisfactory then take shutdown of fan.
24. Weld the piece fully and close the door.
25. If vibration readings were not satisfactory, then 2/3 more trials to taken as per CBM report.
26. Normalize the system, ensure all the safety guards are in place and release all equipment shutdowns and close the work permit.

* **Carry out housekeeping as per procedure** [**WI/MAINT/91**](file:///C:/Users/HP/AppData/Local/Temp/Temp1_SOPHIRA.zip/SOP%26HIRA/IMS%20SOP/HOUSEKEEPING.docx)**.**

**DO**

* Use tested chain blocks & slings only.
* Cordon the total workable area.
* Return back all scrap to store.
* Avoid oil spillage while lubricating the machine. Use oil tray while carrying out lubrication activity
* Use completely sealed goggles while working near dust/graphite.
* Follow work instruction [WI/MAINT/12](file:///C:/Users/HP/AppData/Local/Temp/Temp1_SOPHIRA.zip/SOP%26HIRA/IMS%20SOP/HANDLING%20OF%20MATERIALS.docx) for material handling.
* *Before entering into Fan Casing Manhole door ensure that shutdown of Main Fan is taken.*
* *Before entering into Fan Casing Manhole door ensure about non availability of CO presence.*

**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.
* Start the activity of bags replacement incase Oxygen % is less then 75%.
* *Do not by pass SOP.*
* *Don’t enter in presence of CO.*
* *Don’t enter in if temp is high.*

**REFERENCES:** **Operation & Maintenance manual.**

**Amendement Record**

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| **Date** | **Manual Section Ref. & Para** | **Brief details of Revision** | **New Rev.** |
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| --- | --- | --- |
| **Prepared By:**  Area Engineer | **Reviewed & Issued By:**  Management Representative | **Approved By:**  Mechanical Head |
| **Signature:** | **Signature:** | **Signature:** |
| **Review Date: 15.11.2022** | **Review Date: 15.11.2022** | **Review Date: 15.11.2022** |