**ACTIVITY: COAL CRUSHER MAINTENANCE**

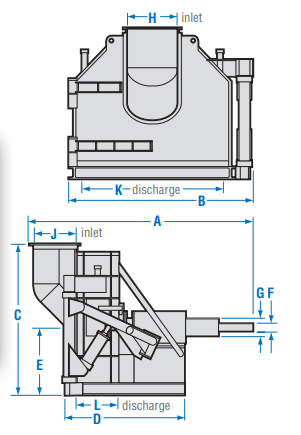
1. **Purpose:** - To describe Safe and quality maintenance procedure of Coal crushers.
2. **Scope:** - Coal Crusher 1 & Coal Crusher 2 of MCD
3. **References.**: - Coal Crusher Manual
4. **Responsibility**: - Engineer- in- charge & Maintenance fitter on the job.
5. **SAFETY PRECAUTIONS:**

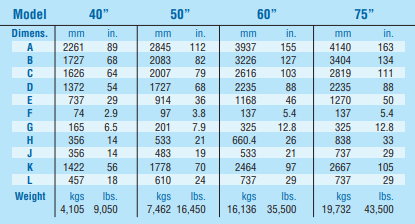
* Ensure all Process, Electrical & Mechanical isolation prior to starting work on equipment. Follow documented isolation procedure as per Vedanta approved isolation standards.
* Seek Proper work permit whenever applicable.
* Job to be carried out by Competent Person.
* Safety briefing / Toolbox talk to be carried out and to be documented.
* Ensure Certified tools and tackles to be used for carrying out ant activity.
* Follow one man one lock system and use of LOTO box.
* Wear approved PPE (Personal Protective Equipment)
* Ensure that workplace is clean and safe.
* Operate pull cord switch / LCS to Off position prior to work as an additional safety measure.
* Ensure all the planned jobs have been completed and release mechanical isolations if applied.
* All unwanted material from the area to be removed before releasing the equipment electrical isolation.
* Follow proper documented procedure for releasing the electrical isolations as per Vedanta approved isolation standards.
* Ensure all the job is completed as planned and all safety guards have been placed and secured properly as per guidelines before releasing the equipment for operation

6.0 PPE to be used :

* Helmet,
* Safety shoes.
* Dust mask.
* Hand gloves.
* Safety goggles.
* Reflector jacket.
* Job specific PPEs face Shield, Full body Harness, lifeline, fall back arrestor, CO detector etc.

**7.0 General Arrangement**





**8.0 Activities**

* Activity No 1 : Inspection of cages.
* Activity No.2 : Coal Crusher cages changing.
* Activity No.3 : Belly Chute changing.
* Activity No.4 : Shaft Assy Changing.
* Activity No.5 : Replacement of drive belts.
* Activity No.6 : Replacement of Motor.
* Activity No.7 : Preventive maintenance

9.0 Aspect- Impact.

Scrap generation Resource Depletion.

Grease Spillage Land Contamination.

Oil Traced waste Generation. Land Contamination and Resource depletion

Dust Generation Air Pollution.

Fumes Health

Fire Hazard Air Pollution.

10.0 Hazards identified

1. Physical Hazard.

* Dust.
* Fire

1. Mechanical Hazard

* Trapping between two objects,
* Fall of material like hammer, tools, slung items, bolts, rollers wedges, etc,
* Fall of person from platform,
* Fall of rotating part like pulleys, couplings and cages.
* Entanglement in between drive belts
* Impact of moving / slung items
* Failure of welded hooks.
* Cut from tool.
* Flying off of gas cutting and welding sparks.

1. Human behaviour aspect of operators:

* Workmen nature.
* Improper housekeeping.
* Alcoholism.
* Casual approach.
* Horse play.
* Back pain
* Non usage of PPEs

1. Electrical hazard.

* Shock.

# Activity No 1 : Inspection of Crusher cages

**Material required.**

Nil

**Tools Required.**

1. General toolbox.

**Procedure:**

1. Isolate the coal crusher with proper isolation procedure as per the Vedanta isolation standard.
2. Remove the door locking wedges.
3. Open the swing away door to access the cages.
4. Clean the material deposits inside the crusher housing and coal crusher cages.
5. Rotate the cages manually to ensure cages rotate free.
6. Check the cages surfaces for any rubbing during the operations.
7. Check the condition of square bars for any deformations and dislocations.
8. Ensure all the striking plates (liners) are secured on the square bar with fasteners.
9. Check the wear pattern of the striker plates. Maximum wear on the striker plate should not expose the square bar in line of striking.
10. Ensure the crusher door seating area is cleaned.
11. Close the door and secure the same by wedge locks.
12. All unwanted material from the area to be removed before releasing the equipment electrical isolation.
13. Follow proper documented procedure for releasing the electrical isolations as per Vedanta approved isolation standards.
14. Release the crusher for operation.

# Activity No 2 : Coal crusher cage changing.

**Material required.**

1. Coal crusher cage set.
2. Bolt HTS, GR 10.9 1inch x 2 inch – 4 Nos.
3. Bolt HTS, GR 10.9 1inch x 2 ¼ inch – 8 Nos.

**Tools Required.**

1. General toolbox.

1. Electrical socket wrench.
2. Torque wrench.
3. Bottle jack.
4. Socket Spanner 38 mm.

**Procedure:**

1. Isolate the coal crusher with proper isolation procedure as per the Vedanta isolation standard.
2. Shift the cages to the coal crusher platform by using proper certified lifting tools and material handling equipment.
3. Open the door of the coal crusher.
4. Clean the material deposits inside the crusher housing and coal crusher cages.
5. Lock the coal crusher cages by locking the drive pulleys with suitable locking arrangement.
6. Remove the center cover by loosening the mounting bolts by using torque wrench and electrically operated device.
7. Loosen the inner cage mounting bolts by using torque wrench and Electrical socket wrench.
8. Remove the inner cage from the crusher assembly by using the cage handling attachment provided with the crusher.
9. Loosen the outer cage mounting bolts by using torque wrench and electrically operated tool
10. Remove the outer cage from the crusher assembly by using the cage handling attachment provided with the crusher.
11. Shift the new / repaired crusher cages within the cage handling arrangement area.
12. Inspect the hub assembly for any deformations. Clean the internal threads of the tapped hole.
13. Install the outer cage to the position with by using the cage handling arrangement provided with the crusher.
14. Tighten the bolts by using the electrical wrench and further to confirm with torque wrench to 85 kg-m
15. Install the outer cage to the position with by using the cage handling arrangement provided with the crusher.
16. Tighten the bolts by using the electrical wrench and further to confirm with torque wrench to 85 kg-m
17. Place the center cover and tighten the bolts by using the electrical wrench and further to confirm with torque wrench to 85 kg-m
18. Rotate the cages and ensure the cages are free.
19. Ensure the crusher door seating area is cleaned.
20. Close the door and secure the same by wedge locks.
21. Shift the removed cages from the crusher platform by using proper certified lifting tools and material handling equipment.
22. All unwanted material from the area to be removed before releasing the equipment electrical isolation.
23. Follow proper documented procedure for releasing the electrical isolations as per Vedanta approved isolation standards.
24. Release the crusher for operation.

# Activity No 3 : Belly chute Changing

**Material required.**

1. New/Repaired belly chute.
2. Bolts M12 x50 mm.

**Tools Required.**

1. General toolbox.
2. Chain Block – 1 T.
3. Belt slings.

**Procedure:**

1. Isolate the coal crusher with proper isolation procedure as per the Vedanta isolation standard.
2. Seek work permit for replacement of belly chute.
3. Shift the new / repaired belly chute to the crusher platform.
4. Remove the belly chute from the crusher housing by removing the mounting bolts. Use proper certified lifting and material handling tools.
5. Position the new belly chute on the crusher and secure by mounting bolts.
6. Shift the removed belly chute from the location.
7. All unwanted material from the area to be removed before releasing the equipment electrical isolation.
8. Follow proper documented procedure for releasing the electrical isolations as per Vedanta approved isolation standards.
9. Ensure all the job is completed before releasing the equipment for operation
10. Release the crusher for operation.

# Activity No 4 : Shaft Assembly Changing.

**Material required.**

1. New/Overhauled shaft assembly.
2. Hardware.

**Tools Required.**

1. General toolbox.
2. Chain Block – 2 T – 2 Nos.
3. Belt slings.
4. Electrical socket wrench.
5. Torque wrench.
6. Bottle jack.
7. Socket Spanner 38 mm.
8. Hydraulic Jack. 50 T Capacity.
9. Fabricated puller.
10. Structural members for fabrication of pusher arrangement at site.
11. Cutting set.
12. Welding machine.

**Procedure:**

1. Isolate the coal crusher with proper isolation procedure as per the Vedanta isolation standard.
2. Seek work permit for replacement of belly chute.
3. Shift the new / overhauled assembly to the crusher platform. Use proper lifting and material handling procedure for handling the assembly.
4. Disconnect drives of both the cages by removing the drive belts.
5. Remove and isolate all the safety interlock switches from the assembly.
6. Remove the inner cage drive pulley by dismantling the taper lock assy. and shift the pulley with proper certified lifting tools & material handling equipment.
7. Prepare suitable puller arrangement suit at site for removing outer cage drive pulley.
8. Properly handle the outer cage drive pulley with proper certified lifting tools and material handling equipment.
9. Remove the coal crusher cages (refer Activity 2 in this work instruction for removal of coal crusher cages)
10. Remove the additional structural supports provided to secure the shaft assy on the base.
11. Remove the shaft assembly foundation bolts.
12. Provide suitable supports to mount the lifting tools (Chain blocks) to lift and shift the shaft assembly from the crusher.
13. Shift the new / overhauled shaft assembly to the location and using the same lifting arrangement position the shaft assembly on the crusher.
14. Provide foundation bolts and additional structural supports.
15. Prepare pusher assembly for pushing the outer cage pulley on the shaft.
16. Mount the outer cage pulley on the shaft with proper lifting tools and material handling arrangement and push with the help of hydraulic jack. Ensure to maintain the correct position on the shaft so that the pulley stands aligned with the motor pulley.
17. Mount inner cage pulley on the shaft and secure with taper lock arrangement.
18. Align the inner cage pulley with the motor pulley.
19. Provide drive belts and tension as recommended standard.
20. Fix all the interlock switches back in position.
21. Remove the coal crusher cages (refer Activity 2 in this work instruction for removal of coal crusher cages)
22. Rotate the cages and ensure the cages are free.
23. Ensure the crusher door seating area is cleaned.
24. Close the door and secure the same by wedge locks.
25. Sufficiently lubricate the shaft assembly bearings before starting the crusher.
26. Shift the removed shaft assembly from the crusher platform by using proper certified lifting tools and material handling equipment.
27. All unwanted material from the area to be removed before releasing the equipment electrical isolation.
28. Follow proper documented procedure for releasing the electrical isolations as per Vedanta approved isolation standards.
29. Ensure all the job is completed as planned and all safety guards have been placed and secured properly as per guidelines before releasing the equipment for operation
30. Release the crusher for operation.

# Activity No 5 : Replacement of drive belts.

**Material required.**

1. Drive belts – SPC 5300/SPC 5000 as per requirement.

**Tools Required.**

1. General toolbox.
2. Crowbar.

**Procedure:**

1. Isolate the coal crusher with proper isolation procedure as per the Vedanta isolation standard.
2. Loosen the motor foundation belts.
3. Shift the motor towards crusher by operating the motor base shift arrangement.
4. Remove the damaged belts.
5. Replace new belts.
6. Tension the drive belts as recommended using motor base shift arrangement.
7. Check the alignment with suitably with straight line or laser alignment kit for more precision.
8. Tighten the foundation bolts.
9. Remove and shift the removed damaged belts to the scrap for proper disposal as per the material disposal guidelines as per Vedanta.
10. All unwanted material from the area to be removed before releasing the equipment electrical isolation.
11. Follow proper documented procedure for releasing the electrical isolations as per Vedanta approved isolation standards.
12. Ensure all the job is completed as planned and all safety guards have been placed and secured properly as per guidelines before releasing the crusher for operation
13. Release the crusher for operation.

# Activity No 6 : Replacement of Motor

**Material required.**

1. New/Overhauled motor.
2. Hardware for motor foundation.

**Tools Required.**

1. General toolbox.
2. Crowbar.
3. Isolate the coal crusher with proper isolation procedure as per the Vedanta isolation standard.
4. Seek work permit for replacement of motor.
5. Shift the new / overhauled motor fitted with pulley / fluid coupling to the crusher platform using proper material shifting arrangement and certified lifting tools.
6. Remove the motor foundation bolts
7. Shift the motor towards crusher by operating the motor base shift arrangement.
8. Remove the drive belts.
9. Remove motor from the base by using proper material handling arrangement and certified lifting tools.
10. Replace motor from the base by using proper material handling arrangement and certified lifting tools.
11. Install the motor on the foundation base and provide foundation bolts.
12. Provide drive belts.
13. Tension the drive belts as recommended using motor base shift arrangement.
14. Check the alignment with suitably with straight line or laser alignment kit for more precision.
15. Tighten the foundation bolts.
16. Shift the removed motor to workshop by using proper material handling arrangement.
17. All unwanted material from the area to be removed before releasing the equipment electrical isolation.
18. Follow proper documented procedure for releasing the electrical isolations as per Vedanta approved isolation standards.
19. Ensure all the job is completed as planned and all safety guards have been placed and secured properly as per guidelines before releasing the crusher for operation
20. Release the crusher for operation.

# Activity No 7 : Preventive Maintenance.

Preventive Maintenance of Belt feeders and Weigh feeders are cover under

1. CLTI. (Cleaning, Lubrication, Tightening, Inspection)
2. Monthly Preventive maintenance.
3. Quarterly Preventive Maintenance.
4. Half Yearly Preventive Maintenance.
5. Yearly Maintenance.

CLTI is basically is routine run check inspection and any identified abnormality is documented and updated in SAP in MR Notification. On opportunity the same is resolved and the abnormality is closed.

**Lubrication of Coal Crusher**

1. Isolate the coal crusher with proper isolation procedure as per the Vedanta isolation standard.
2. Remove the guards for entering the shaft assembly area.
3. Use EP-2 grease for crusher bearings and bearing seal lubrication.
4. Lubricate outer cage shaft and inner cage shaft bearings at identified lubrication points.
5. Lubricate bearing seals at identified lubrication point.
6. Re fix the guards and secure with hardware provided.
7. Follow proper documented procedure for releasing the electrical isolations as per Vedanta approved isolation standards.
8. Ensure all the job is completed as planned and all safety guards have been placed and secured properly as per guidelines before releasing the crusher for operation
9. Release the crusher for operation.

**Procedure for Preventive maintenance**

1. Check the preventive maintenance schedule in SAP.
2. Take system generated print of generated PM and hand it over to maintenance crew for execution.
3. Isolate the required Weigh Feeder / belt feeder with proper isolation procedure as per the Vedanta isolation standard.
4. Carry out all tasks mentioned in the checklist as per guidelines and update the job completed and actual conditions with the time taken for completion of the job.
5. Ensure all the jobs are completed and in case of any abnormality or pending jobs in the list, a separate notification must be raised in SAP for ensuring the compliance.
6. All unwanted material from the area to be removed before releasing the equipment electrical isolation.
7. Follow proper documented procedure for releasing the electrical isolations as per Vedanta approved isolation standards.
8. Run the belt on no load and track the belt and check the operation of belt for any belt sway.
9. Ensure all the job is completed as planned and all safety guards have been placed and secured properly as per guidelines before releasing the equipment for operation.
10. After completion of PM activity, the generated order needs to be closed within 24 hrs of the execution.
    1. **RECORDS:**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Sr. No.** | **Record No.** | **Record Title** | **Maintained by** | **Soft/Hard form** | **Retention Time** |
| 1. |  | CLTI | Area in Charge | Hard | 1 Yr. |
| 2. |  | PM Checklist | Area in Charge | Hard | 1 Yr. |
| 3. |  | Notification Data | Area in charge | Soft |  |
| 4. |  | Hazard Identification | IMS | Soft | 1 Yr. |
| 5. |  | Risk Assessment | IMS | Soft | 1 Yr. |

|  |  |  |  |
| --- | --- | --- | --- |
| **Date** | **Manual Section Ref. & Para** | **Brief details of Revision** | **New Rev.** |
| 13-08-2022 | Header | Company logo & Document no. | 07 |
|  |  |  |  |
|  |  |  |  |

|  |  |  |
| --- | --- | --- |
| **Prepared By:**  Head Mechanical Maintenance, Battery 1- MCD | **Reviewed & Issued By:**  Management Representative | **Approved By:**  Head Mechanical Maintenance MCD |
| **Signature:** | **Signature:** | **Signature:** |
| **Review Date: 13.08.2022** | **Review Date: 13.08.2022** | **Review Date: 13.08.2022** |