**WORK INSTRUCTION FOR MAINTENANCE OF SINGLR ROLLER CRUSHER**

1.0 PURPOSE

Safe Maintenance of furnace Single roller crusher for optimum performance.

2.0 SCOPE

Sinter Plant

This procedure applies to Single Roller Crusher VL/IMS/SP/MECH/WI/20

3.0 RESPONSIBILITIES

Area Engineer / Shift Engineer

Workmen on the job

4.0 PROCESS DESCRIPTION

Maintenance of Single Roller Crusher

**Do’s:**

* Use Co monitor to check the concentration of gas
* Ensure the workers are using hand gloves
* If required move the machine forward to reduce the heat in the working vicinity.

**Don’ts:**

* DO not start the work immediately after stopping the furnace. Equipment’s will be at high temperature.

|  |  |  |
| --- | --- | --- |
| **ENERGY SOURCE** | **HAZARDS PRESENT** | **ISOLATION** |
| **Electrical** | YES | Sinter Machine/Single Roller Crusher |
| **Mechanical/Kinetic** | NO | No |
| **Hydraulic** | NO | NO |
| **Pneumatic** | NO | NO |
| **Steam** | NO | NO |
| **Chemical** | NO | NO |
| **Thermal** | Yes | High temperature |
| **Radiation** | NO | NO |
| **Poor Illumination** | Yes | Black Out |

**PPE’s & OTHER SAFETY EQUIPMENT REQUIRED:**

* **PPEs to be used**
* Hand Gloves
* Safety Helmet
* Safety Shoes
* Safety Goggles
* Heat Resistant Jackets
* **PPEs to be used: -** Helmet, Safety shoes, hand gloves, Dust mask and safety goggle
* **Activity No 1 : -** Hard facing of crusher teeth.
* **Activity No 2 : -** Grizzly bar replacement.
* **Activity No 3 : -** Rotary catcher maintenance & replacement.
* **Activity No 4 : -** Replacement of Rotor assembly
* **Activity No 5 : -** Replacement of SRC Gearbox
* **Activity No 6 : -** Replacement of Motor
* **Activity No 7 : -** Replacement of V Belt
* **Activity No 8 : -** Replacement of output coupling Teflon bushes

.

**Hazards Identified:**

**Mechanical hazard**

1. Inhaling of dust.
2. Fire hazard.
3. Fall of material
4. Accident due to improper shutdown
5. Flying of Chips during hammering**.**
6. Failure of sling, chain pulley block, improper hooks welding.
7. Fall of a person.
8. High temperature

**Electrical hazard**

1. Electrical shock in welding

**Activity No 1: Hard facing of crusher teeth**

1. Ensure that pallet car is empty, if not; request the production to do so.
2. Take work permit from the shift Superintendent / production in charge and obtain the shutdown clearance from Electrical Department of Sinter Machine, TESP Fan, Tail ESP Damper & Single Roll Crusher with LOTO.
3. If more than one worker is relying on the protection of an isolation, then all workers should apply their own locks in master lock out box
4. Press local push emergency button of the SRC & SINTER MACHINE.
5. Open SRC manual door to obtain comfortable working temperature.
6. Provide direct earthing to SRC
7. If crusher teeth is more than 10 mm worn, then buffer layer -1 (Tera PS 91) should be applied. For less than 10mm Buffer Layer 2 (CPBF 024) should be applied on the job.
8. For Final Coating (top 2 layers) apply 2 layers of PYRO CARB 077 final layer should be chequered pattern
9. After completion of the job close the SRC door.
10. Clear shutdown & handover to production.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Single roll crusher hard facing-Initial** | | | | | | |  |
|  |  |  | Diffusion | | Larsen & Toubro Limited | |  |
| Sr No | Type of layer | Unit | Product name | Unit Price（USD） | Product name | Unit Price（USD） |  |
|  |
| 1 | **Buffer layer -1** | Kg |  |  | Tera PS 91 | 475 |  |
| 2 | **Buffer layer -2** | kg | Diffusaloy-6180 | 2,211 | CPBF 024 | 1,106 |  |
| 3 | **Final Layer** | kg | Diffusaloy-68 | 1,818 | Pyro Carb 077 | 3,884 |  |
|  | **Total** |  |  | **4,029** |  | 5,465 |  |

**Activity No 2 : Grizzly bar replacement**

1. Take clearance from production department (Work Permit) from the shift Superintendent / in charge after following all the necessary safety points indicated in the work permit**.**
2. Obtain the shutdown for sinter machine, single roll crusher & sinter cooler, from Electrical Department.
3. If more than one worker is relying on the protection of an isolation, then all workers should apply their own locks in master lock out box
4. Press local push emergency button of the Equipment.
5. Surrounding area needs to be clean thoroughly for access to remove grizzly bar mounting trolley.**(Resp.-Operation)**
6. Remove cover plates.
7. Grizzly bar mounting trolley supporting/locking pads to be removed out by lifting with hydraulic jack.
8. Pull out trolley with help of chain pulley block (cap. 5t) / winch.
9. Inspect the grizzly bars.
10. Rotate or replace the worn out grizzly bar with help of EOT crane.
11. Assemble the Grizzly bar mounting trolley.
12. Reposition the Grizzly bar mounting trolley with help of chain pulley block (cap. 5t) / winch.
13. Check clearance between SRC & grizzly bar by rotating SRC by hand.
14. Maintain uniform gap both sides of SRC spikes.
15. Fix supporting pads for Grizzly bar mounting trolley & rest the same.
16. Lock & fix Grizzly bar mounting trolley.
17. Ensure grizzly is properly locked by welding to avoid dislocation
18. Fix back cover plates.
19. Ensure bolts to be tightened properly with washers.
20. Remove all tools and tackles from the vicinity.
21. Clear electrical shut down. Take trial in manual mode.
22. If found satisfactory, clear work permit and handover to production.

**Activity No 3**  **:  Rotary catcher maintenance & replacement.**

1. Take clearance from production department (Work Permit) from the shift Superintendent / in charge after following all the necessary safety points indicated in the work permit**.**
2. Obtain the shutdown for single roll crusher, cooling tower pump from Electrical Department
3. If more than one worker is relying on the protection of an isolation, then all workers should apply their own locks in master lock out box
4. Press local push emergency button of the equipment.
5. Close inlet/outlet water line valve to SRC rotary catcher.
6. Disconnect the hose connection from rotary catcher.
7. Remove rotary catcher to be replaced.
8. Inspect rotary catcher assembly for direction(left/right)
9. Replace rotary catcher with new /repaired.
10. Ensure lubrication of bearing in rotary catcher.
11. Connect water hose.
12. Open valves & clear pump shut down.
13. Take trial for leakage.
14. If found satisfactory, clear work permit and handover to production.

**Activity No 4 : Replacement of Rotor assembly**

1. Confirm for the electrical isolation of tail ESP fan, lub System, water pump, sinter machine, sinter cooler & SRC.
2. If more than one worker is relying on the protection of an isolation, then all workers should apply their own locks in master lock out box
3. Press local push emergency button of theEquipment.
4. Ensure sinter machine is emptied.
5. Disconnect & remove Cooling water line, lubrication line, hood cover, side deck concerned with SRC rotor.
6. De couple SRC rotor.
7. Remove Plummer block foundation bolts of SRC shaft.
8. Check for any obstruction for Lifting the SRC rotor.
9. Lift SRC rotor by using proper sling & 32 t EOT crane.
10. Position new rotor with help of 32 t EOT crane.
11. Position & align SRC rotor.
12. Tighten all Plummer block bolts.
13. Fix all side deck & hood cover.
14. Connect Cooling water line, lubrication line, concerned with SRC rotor.
15. Take trial of SRC unit manually.
16. Take trial of SRC with electrical drive.
17. If satisfactory hand over to operation.
18. Normalise all shut downs.
19. Remove all tools and tackles from the vicinity.

**Activity No 5 :  Replacement of SRC Gearbox.**

1. Take clearance from production department SS/CR.
2. Take electrical shutdown of SRC, .
3. If more than one worker is relying on the protection of an isolation, then all workers should apply their own locks in master lock out box
4. Press local push emergency button of the SRC.
5. Remove all guards and V Belt.
6. De couple the output and input coupling.
7. Remove the 18mtr platform chequered plate and barricade the area with metal barricading (flat and pipe).
8. Remove all base bolts of gearbox.
9. Lift SRC gearbox by using proper sling & 32/5 t EOT crane.
10. Position new gearbox with help of 32/ t EOT crane.
11. Position & align SRC gearbox.
12. Tighten all bolts of gearbox fix the bushes and v belt.
13. Fix all side guards & top chequered plate.
14. Take trial of SRC unit manually.
15. Take trial of SRC with electrical drive.
16. If satisfactory hand over to operation.
17. Normalise all shut downs.
18. Remove all tools and tackles from the working area.

**Activity No 6 : Replacement of Motor.**

1. Take clearance from production department SS/CR.
2. Take electrical shutdown of SRC.
3. If more than one worker is relying on the protection of an isolation, then all workers should apply their own locks in master lock out box
4. Press local push emergency button of the SRC.
5. Remove the connections: Ele
6. Remove all guards and V Belt..
7. Decouple the input coupling.
8. Remove base bolts of motor.
9. Remove the motor by using EOT Crane 5ton with certified slings.
10. Fix the new motor by using crane.
11. Aling the motor with gearbox.
12. Fix all guards and V Belt.
13. Take trial manually if found satisfactory handover to production.
14. Normalise all shut downs.
15. Remove all tools and tackles from the working area.

**Activity No 7 : Replacement of V Belt.**

1. Take clearance from production department SS/CR.
2. Take electrical shutdown of SRC.
3. If more than one worker is relying on the protection of an isolation, then all workers should apply their own locks in master lock out box
4. Press local push emergency button of the SRC.
5. Remove all guards and V Belt.
6. Fix and aling the new V Belt

Fix guards

1. Take trial manually if found satisfactory handover to production.
2. Normalise all shut downs.
3. Remove all tools and tackles from the working area.

**Activity No 8 :-Replacement of output coupling Teflon bushes.**

1. Take clearance from production department SS/CR.
2. Take electrical shutdown of SRC.
3. If more than one worker is relying on the protection of an isolation, then all workers should apply their own locks in master lock out box
4. Press local push emergency button of the SRC.
5. Remove the coupling guard.
6. Mark the coupling position top surface by using punch.
7. Remove the cover plate and bushes of coupling.
8. Fix the new bushes by using hyd. Jack 10ton (Certified tools only).
9. Fix the cover plate and guard.
10. Take trial manually if found satisfactory handover to production.
11. Normalise all shut downs.
12. Remove all tools and tackles from the working area.

**FURNACE REFRACTORY BRICKS POSITIONING**

**Work Instruction**

Inform the person in control room and ensure that all the valves (shut off valve, Goggle valve) in BFG line are closed and LOTO on goggle valves near Sinter Plant and water seal near PCI .**Refer working on BFG line in SP (**WI/SP/MAINT/14)

1. Take electrical shut down of sinter machine.
2. Take shutdown electrical/mechanical isolation of valves that are closed.
3. If more than one worker is relying on the protection of an isolation, then all workers should apply their own locks in master lock out box
4. Press local push emergency button of the Sinter machine.
5. Check CO concentration in working area.
6. If the bricks have come down from its position tighten the anchor bolts which are projected in the furnace platform to bring back the bricks to its position
7. If sufficient gap is not available between the bricks & pellet car after full tightening of bolts then remove the top side wall of the pellet just below the bricks
8. Use hydraulic jack for lifting the brick. Ensure the jack is certified by concerned authorities before using it
9. Once the brick is lifted providing sufficient gap (25 mm) tighten the anchor bolts
10. Release the jack.
11. Fix the top side wall of pellet car and tighten all four bolts of size 20mm. Spanner used {ring spanner , D-spanner & hammering spanner (30)}
12. Ensure all tools have been cleared from the vicinity.
13. Clear all electrical shutdown/mechanical isolation of the valves that are closed & inform to production.

**Activity No 2  :**  Furnace refractory Block replacement.

1. Take electrical shut down of sinter machine.
2. Take shutdown electrical/mechanical isolation of valves that are closed.
3. If more than one worker is relying on the protection of an isolation, then all workers should apply their own locks in master lock out box
4. Press local push emergency button of the Sinter machine.
5. Check CO concentration in working area.
6. Remove the cover plate of furnace by using EOT Crane.
7. Loosen the j-hook bolts.
8. Cut the hooks of blocks and remove it.
9. If sufficient gap is not available between the bricks & pellet car after full tightening of bolts then remove the top side wall of the pellet just below the bricks
10. Use hydraulic jack for lifting the brick. Ensure the jack is certified by concerned authorities before using it
11. Once the brick is lifted providing sufficient gap (25 mm) tighten the anchor bolts
12. Release the jack.
13. Ensure all tools have been cleared from the vicinity.
14. Clear all electrical shutdown/mechanical isolation of the valves that are closed & inform to production.

**Amendement Record**

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

|  |  |  |
| --- | --- | --- |
| Prepared By:  Ass. Manager – Sinter Plant | Reviewed & Issued By:  Management Representative | Approved By:  Head Sinter Plant |
| Signature: | Signature: | Signature: |
| Review Date: 13.11.2022 | Review Date: 13.11.2022 | Review Date: 13.11.2022 |