ACTIVITY: DESULPHURISATION UNIT MAINTENANCE

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* Objective : - Safe maintenance of desulphurization unit for optimum Performance
* Scope : - Hot metal handling area
* Ref. : -
* Responsibility : - Engineer In charge and workmen on job.

PPE –s to be used:

* Helmet, Safety shoes, Cotton cloth and complete sealed goggle (for activity 1&2 )

Work no 1: Hose replacement of Desulphurization unit

Work no 2: Maintenance activities on De-dusting unit

Work no 3: ID fan casing replacement

Work no 4: Desulphurization de-dusting unit modification

Work No 5 : Hydraulic Cylinder Replacement

Work No 6: Replacement of ladle car wire rope

Work No 7: Replacement of Lance

Work No 8: Ladle car maintenance

Work No.9: Lime Conveying unit –Pipe line choke up Maintenance

Work No.10: Lime Conveying unit –Dome Valve Replacement

Work No.11: DS ID fan bearing changing

Work No.12: RAV changing for FD Cooler and BAG house

Work No.13: Hood winch gearbox changing

Work No.14: Maintenance activities on lime screw conveyor.

Work No.15: DS Bag house bag and bag cage changing.

Aspect – impact

|  |  |
| --- | --- |
| Dust Generation | Air pollution |
| Scrap generation | Resource Depletion |

Hazards identified

Physical Hazard

1. Pressure, temperature
2. Fire
3. Graphite and dust falling in eyes.
4. Exposure to hot metal/slag splatters
5. Impact of chips in eyes or any body part while working near PCM area
6. Burn injury from hot metal splashing or spillage
7. Explosion of hot metal
8. Fly over of lime particles in eyes and any other body part while working in DS unit and accessories.

Mechanical Hazard

1. Trapping between two objects.
2. Fall of material, hammer, tools, slinged items, bolts.
3. Fall of person from platform.
4. Entanglement.
5. Impact of moving / slinged items.
6. Fall of metal jam/castable from ladlehood while working underneath
7. Entanglement with ladle car wire rope
8. Slipping of person in graphite
9. Trapping of person during the fall of material from crane height
10. Trapping of person between crane wheel/ structure and rail
11. Hitting of ladle or hook while shifting / crane moving.

Chemical hazard

1. Fall of lime powder in eyes, nose, mouth
2. Skin rashes when bare skin exposed to burnt lime

**Behavioral Hazard:**

1. Workmen under influence of alcohol
2. Violation of procedure
3. Not wearing PPE’s

**Work no 1: Hose replacement of Desulphurization unit**

1. Take work permit from production department.
2. Ensure that compressed air line valves are closed and isolated.

Always release the pressure before start working on the desulphurization.

The Relief valve should be checked for choke as at times lime get deposited in valve bore preventing release

1. Open the end connections of the hose using proper tools
2. Check for any damage in the threads of mating parts for effective locking and replace if required with 25 mm thread length connectors only.
3. Ensure that the workers wear full apron and goggle fully covering the eye before opening hose pipes or flanges of canister tank as burnt lime on contact with bare skin can give rashes, oil to be applied to skin where required
4. Incoming valves to be closed before opening the hose pipes for replacement.
5. For replacing hydraulic oil hose pipes, shut down of hydraulic oil pump should be taken
6. Fix the clean/new hose and ensure proper tightness
7. The removed old hose should be cleared from the work place and to be return back to store for proper disposal
8. Give clearance for the operation and check for any leakage

**Work no 2: Maintenance activities on De-dusting unit**

1. After every D/S campaign, keep all the inspection doors open and ensure full system is emptied of lime deposits thoroughly
2. For any patching jobs on ducts, cutting welding jobs should be taken up only after running ID fan at least for 5 mins to vent out entrapped gases and then run for 5 more mins after opening the vent valves for purging purpose, then keep all the inspection doors open and run for another 5 mins.
3. Take ID fan shutdown before starting any cutting/welding jobs
4. CO monitor to be carried by the workmen while opening the flanges.
5. For cutting, welding activities, follow SP-44
6. Clear shut down of ID fan and remove scrap from the area before handing over to production

Work no 3: ID fan casing replacement

1. Run ID fan dry for 5 mins before taking shut down
2. Take shut down of ID fan
3. Keep all the inspection doors open to vent out entrapped gases
4. Give extra supports to chimney if required to remove base box
5. Start dismantling the casing by gas cutting, follow SP-44
6. Check ID fan alignment and shaft setting before assembling fabricated plates
7. Start assembling the fabricated plates for enclosure
8. Provide inspection door with hinges
9. After the welding is done, take trials of ID fan by inching to check for abnormalities
10. Take vibration readings and current readings to check for smooth running
11. Clear shut down and remove scrap before handing over to production.

Work no 4: Desulphurization de-dusting unit modification

1. Take work permit from shift superintendent.
2. Cordon the area near desulphurisation dedusting unit and do ensure to take care of ladle transfer car movement in its vicinity.
3. Take electrical shutdown of dedusting unit ID fan.
4. Dismantle the corroded chimneys and the structures by gas cutting. Ensure that area bottom area is cordoned.
5. Modify the chimney mounting box to suit to newly fabricated chimney.
6. Erect the new chimney and do proper welding at the joints to prevent any leakages.
7. Do the chimney supporting by welding the supports at 2 meters span.
8. Position it properly and do the welding of supports.
9. After completion of welding and bolting, clear the ID fan shutdown and take trials.

**Work No 5 : Hydraulic Cylinder Replacement**

1. Take work permit from production department
2. If the cylinder is on load, operate the system with the permission of production department & remove the hydraulic load on the cylinder.
3. Take electrical shutdown of hydraulic power-pack.
4. Slowly loosen the fittings to release the hydraulic oil pressure and collect the oil in empty container. Care should be taken to prevent the oil spillage to ground.
5. Loop the hoses of the cylinder as well as piping. Tag the pipeline ports with proper identification
6. . Take load on chain pulley block and loosen foundation bolts of cylinder.
7. Follow material handling procedure (WI/MAINT/12) for cylinder replacement
8. Once the new cylinder is in position properly tighten foundation bolts
9. Connect the hoses
10. Clear the electrical shutdown & take trial
11. Attend leakages, if any.
12. Clear the work permit

Work No 6: Replacement of ladle car wire rope:

1. Take work permit from production department
2. Ensure that the ladle hood is in backward position (near winch end). Take electrical shutdown of electric winch of the ladle
3. Check the wire rope of the winch for any damage. Replace if it is damaged by following steps
4. Remove the wire rope from central pin arrangement on the forward end and unwind the wire rope
5. Lay new 16mm wire rope. Connect one end of the wire rope to the central pin on the forward end by bull dog clamps and the other end to the winch drum. Ensure that minimum two round of windings should be kept on winch drum
6. Clear electrical shutdown temporarily and take the car forward position. Take electrical shutdown again
7. Remove the wire rope from central pin arrangement on the back end and unwind the wire rope
8. Lay new 16mm wire rope. connect one end of the wire rope to the central pin on the back end by bull dog clamps and the other end to the winch drum. Ensure that minimum two round of windings should be kept on winch drum
9. Ensure the tightness of bull dog clamps
10. Clear electrical shutdown and take trial
11. Clear work Permit

Work No 7: Replacement of Lance:

1. Take electrical shutdown of hydraulic powerpack by keeping cylinder at 80% retracted position
2. Remove the hose connection and elbow fittings, connected to the lance
3. Connect the hooking arrangemnt to the lance
4. Remove the lance holding clamps at lance holder's end and ladle hood end
5. Slowly lower it down by means of manilla rope/chain pulley block/electric hoist to the ground level through the hole, provide at ladle hood for lance movement
6. Remove the sling from the old lance and connect with the new lance
7. Slowly lift it by means of manilla rope/chain pulley block/electric hoist to the through the hole, provide at ladle hood for lance movement
8. Clamp the lance at lance holder's wnd and ladle hood end
9. Remove the hooking arrangement
10. Connect the elbow fitting and hose to the lance
11. Clear electrical shutdown of the power pack and take trial &hand over

Work No 8: Ladle car maintenance:

1. Check for free movement of all 4 wheels
2. Replace if required by following below mentioned steps
3. Place the ladle car outside ladle hood and Take electrical shut down of the ladle car
4. Take load on hydraulic jack and lossen plummer block foundation bolts
5. Replace the wheel and tighten block foundation bolts
6. Slowly release the load on hydraulic jack
7. Follow greasing procedure as per WI/MAINT/93
8. Clear electrical shutdown and take trial

Follow the procedure of house keeping [WI/MAINT/91](file:///\\192.168.6.5\PIP_Maintenance\AppData\Local\Microsoft\Windows\qehs\departmental%20manual\11%20%20Work%20instruction\WIMAINT91%20HOUSE%20KEEPING.doc) and Fabrication erection procedure [WI/MAINT/94](file:///\\192.168.6.5\PIP_Maintenance\AppData\Local\Microsoft\Windows\qehs\departmental%20manual\11%20%20Work%20instruction\WIMAINT94%20%20FAB%20DISMANTLING%20&%20ERECTION.doc)

Work No 9: Lime Conveying Unit -Pipe line choke up Maintenance:

1. Take clearance from production
2. Ensure Knife gate valve of DS unit is in closed position and it is kept OFF
3. Put it OFF Lime dozing unit PLC Panel – Responsibility Instrumentation engineer
4. Close the Main air line Valve of dome cylinder and lime conveying pressure line
5. Remove the conveying pipe line flanges, distant pieces,
6. Check and Clean the choke up pipes
7. Fit back all Cleaned pipelines
8. Normalize the activity no.3 &4
9. Give clearance to Production

Work No 10:Lime Conveying Unit - Dome valve Replacement :

1. Take Electrical Shutdown of Lime Conveying Unit
2. Take Work Permit from production
3. For changing Dome valve ensure that Receiving Hopper is in empty condition
4. Close the Main air line Valve of dome cylinder and lime conveying pressure line
5. Disconnect the Dome cylinder air hose lines – Responsibility Instrumentation Engineer
6. Remove the Distant piece by removing bolts
7. Subsequently remove the Dome valve assembly and replace the same with new one
8. Check the condition of gaskets, if damaged replace with new one
9. Fit back the distant piece and ensure that all bolts are fully tightened
10. Normalize the activity no.4 &5
11. Clear the electrical shutdown and Give clearance to Production

Work No.11: DS ID fan bearing changing

1. Take Work Permit from production
2. Take electrical shutdown of DS ID fan
3. Open casing cover of the id fan and also remove coupling bolts.
4. Open the plummer block bolts and open top halfs .
5. Remove the fan with shaft from casing and change bearings by removing coupling using puller.
6. Put back the fan in the casing once the new bearings are in place and do alignment with motor.
7. Put back the casing cover of the id fan.
8. Take vibration readings and current readings to check for smooth running
9. Clear shut down and remove scrap before handing over to production

Work No.12: RAV changing for FD Cooler and BAG house

1. Take Work Permit from production .
2. Take electrical shutdown of DS ID fan & RAV.
3. Loosen motor base bolts and remove the chain drive system.
4. Remove the flange bolts of the RAV and carefully remove it.
5. Ensure person working has full body apron and full eye cover goggle.
6. Ensure that the FD cooler or Bag house completely empty before completely removing the RAV.
7. Change the old RAV with new one & tighten the flanges.
8. Put in the chain drive sytem with motor in line and tighten the base bolts of motor.
9. Clear shut down and remove scrap before handing over to production

Work No.13: Hood winch gearbox changing

1. Take Work Permit from production .
2. Take electrical shutdown of hood winch drive.
3. Ensure the hood is in lower most position by removing the limit switch and resting on roof hanger bolts and safety chains.Before working on gearbox ensure there will be no movement of hood by locking winch pulleydrum securely by welding
4. Remove the first\ second intermediate gearbox by removing base bolts and coupling bolts and change with new one.
5. Do alignment of the gearbox and tighten base bolts.
6. Clear shut down and remove scrap before handing over to production.

Work No.14: Maintenance activities on lime screw conveyor.

1. Take Work Permit from production .
2. Take electrical shutdown of lime screw conveyor.
3. For tripping due to jam problem. Remove the top and bottom inspection covers of lime screw conveyor.
4. Once inspection cover in open clear the stuck foreign body mainly welding electrode& nails mostly stuck at the bottom end.
5. Temporary clear the shut down and inch the conveyor to remove any unseen stuck particles, and see if screw conveyor is running smooth.( Ensure that the persons working are away from moving machinery and activity is carried in strict control)
6. Once it is found running ok. Take shutdown again and put back the inspection covers.
7. For changing gearbox of screw conveyor. Remove the mounting bolts of gearbox connected to screw conveyor pipe and pull out the gearbox carefully by taking load of gearbox using 3T lime handling crane and pulling out the geabox. Gearbox has a male spline shaft and conveyor has female spline.
8. Put in the new gearbox & Check oil level and top up as required .
9. Clear shut down and remove scrap before handing over to production

Work No.15: DS Bag house bag and bag cage changing.

1. Take Work Permit from production .
2. Take electrical shutdown of DS ID fan & isolate airline to pulsing of bag house.
3. For changing Bags and cage remove the top cover and locking plate.
4. Remove the pulse air line pipe.
5. Remove the cylindrical bag with cage.
6. Enusre proper PPE while working ie full cover goggles, gloves and apron. As lime might be present with dust.
7. Remove\ replace Bag with cage.
8. Put back the pulse air line and lock plate
9. Put back the top cover.
10. Clear shut down and remove scrap before handing over to production

DO

* Keep work area neat and clean
* Dilute the waste cast able with water before release to the environment.
* Always wear goggle, dust mask, gloves, cotton cloth while working
* Wear hand gloves, goggles, safety shoes and cotton cloth while working and operation.
* Use dust mask in dusty area.
* Maintenance workmen going to work on burnt lime handling equipment should compulsorily wear appropriate PPE like long sleeve apron including fully covered goggles and also should apply coconut oil to the exposed body parts.

**DO NOT**

* Keep the cast able open in windy air.
* Gas cutting or welding on the unit before ensuring complete purging of the unit by running the ID fan idle and venting out the entrapped gases
* Stand underneath ladle hood area
* Work in the DS Unit area when PCM#4 pouring goes ON

**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: 12.12.22** | **Review Date: 12.12.22** | **Review Date: 12.12.22** |