1. **PURPOSE:** Instructions for maintenance of Battery machines
2. **SCOPE:** Battery -1
3. **RESPONSIBILITY:** Company Engineer, maintenance Fitter and workmen at job
4. **SAFETY PRECAUTIONS:**

* Ensure all Electrical & Mechanical isolation prior to starting work on equipment. Follow documented isolation procedure as per Vedanta approved isolation standards.
* Take Electrical shutdown of respective machines-Hot Coke Car, Charge Car 2, Charge Car 3, Ram car & work permit, if necessary, before attending any electrically operated units.
* Safety briefing / Toolbox talk to be carried out and to be documented
* Follow *one man one lock* system and use of LOTO box.
* Check availability of valid DCP fire extinguishers, if not available then inform shift in charge.
* Check and ensure safety of man and equipment before starting operations.
* Remove excess grease from equipment to avoid falling on ground.
* 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.
* *Certified lifting Tools & Tackles* to be used for the job.

1. **PPE to be used :**

* Safety Helmet
* Safety shoes
* Safety Goggles
* Hand gloves
* Dust mask
* Welding shield & welder apron
* Cutting Goggles

1. **Activities**

Activity No 1 : Non Drive/Drive Wheel Changing For All Cars

Activity No 2 : Bogie Wheel Changing For Ram Car

Activity No 3 : Ram Car Pusher Non Drive shaft Bushes Changing

Activity No 4 : Brake Unit Overhauling

Activity No 5 : Gear Box Oil Changing

Activity No 6 : 'V' Belt Changing

Activity No 7 : Leveller Checking.

Activity No 8 : Pusher shield replacement *–Ram car*

Activity No 9 : Charge car -2 cone changing

Activity No 10 : Leveller changing

Activity No 11 : Pusher beam changing

Activity No 12 : Checking *shrink disc coupling* of all cars

Activity No 13 : Checking of *L.T. wheels bearing* of all cars

Activity No 14 : Rectification of *Counter Pressure Roller-Pusher Machine*

Activity No 15 : Replacement of *Latching cylinders-CCM*

Activity No 16 : Rail lock mechanism replacement-CCM

Activity No 17 : Preventive Maintenance.

1. **Aspect-Impact:**
2. Scrap generation Resource Depletion.
3. Dust Generation Air Pollution.
4. Oil Spillage Land Contamination & Resource depletion
5. Used Cotton Cloth/Handgloves Land Contamination
6. Used grease/oil Land contamination, Resource depletion
7. **Hazards** **identified**
8. Physical Hazard

* Fall of Hot coke , flying of coke dust and fines
* Slip due to Oil
* Dripping hot water from tray
* Contact with hot structural parts of tray bottom
* Electrical shock
* High Temperature

1. Mechanical Hazard

* Impact, Entrapment, Entanglement, Slip , trip and fall

1. Chemical Hazard

* Fire and explosion, fumes.

1. Ergonomical Hazard

* Poor workplace design

1. Human behaviour aspect of operators:

* Alcoholism.
* Casual approach.
* Horse play.
* Non usage of PPE’s
* Improper Housekeeping
* Height Phobia

1. **PROCEDURE:**

**Activity No 1:Non Drive/Drive Wheel Changing For All Cars**

         Take the electrical isolation (LOTO) shutdown of respective car under maintenance (power shutdown or LT shutdown)

         Lift the Chassis of the cars with the help of 2 jacks of 50 ton capacity until the wheel gear is free from the pinion.

        Ensuring proper packing is provided below the chassis and release the load on the jack.

        Remove plumber block mounting bolts of both sides.

        Remove the wheel out by rolling on the rails.

* Do the required surface preparation for locking the plumber block-fixing guide.
* Place the new wheel in position and match the Plummer block bolts and tighten the Plummer bock bolts.
* It is to be noted that only after tightening the Plummer block bolts the bearing sleeve to be tightened.
* Check bearing sleeve for tightness and apply grease (applicable for taper bore bearing).For Ram cars and hot coke cars after fitting taper bore bearing, Thrust bearing needs to be fitted.
* After wheel assembly is completed, roll the assembly back to the position. Place the jack again to remove packing provided earlier and release the jack.
* Clear electrical isolation (LOTO) and take the trial.

**Activity No 2:Bogie Wheel Changing For Ram Car**

* Take electrical isolation (LOTO) for Ram Car (power shutdown or LT shutdown) .

         Lift the Chassis of the cars with the help of 2 jacks of 50 ton capacity until the wheel gear is free from the pinion.

* Ensure proper packing is provided below the chassis and release the load on the jacks
* Remove the mounting bolts of the bogie wheel.
* Pull the wheel out.
* Place the new wheel and tighten the bolts.
* Check bearing sleeve and grease
* Put the jack again, remove packing and release the jack.
* Clean electrical isolation (LOTO)and take trial.
* For ram car I, refer annexure I
* For bogie  assembly hinge pin to be removed

**Activity No 3: Ram Car Pusher Non Drive shaft Bushes Changing**

         Take electrical isolation (LOTO) after placing pusher 1-2 meters away from retract position. (power shutdown or pusher shutdown)

* Flush the working area/ equipment with water for cooling.

         Remove Plummer block bolts and Plummer block covers.

         Slide the non-drive shaft out.

         Remove old bushes and insert new bushes

         Move the shaft in position and place Plummer block cover.

         Tighten the bolts. and weld plate at end to lock the bush from coming out.

         Clean electrical isolation (LOTO) and take trial.

**Activity No 4: Brake Unit Overhauling**

         Take Electrical Isolation (LOTO) for the required car (power shutdown or LT shutdown).

         Loosen Brake Regulating Stud.

         Remove Old Shoes and Replace with the new.

         Lubricate Pins.

         Check Springs And Replace if Necessary.

         Lubricate all Pivot Points.

         Adjust Brake By Regulating Stud.

         Release Electrical isolation ( LOTO) and take trial.

**Activity No 5: Gear Box Oil Changing**

         Take electrical isolation (LOTO) of the required car (power shutdown or Drive shutdown).

         Remove drain plug to drain old oil in container.

         Flush gearbox with old oil to remove any foreign particles.

         Check/ inspect gear teeth.

         Put the drain plug back and tighten the same fully.

         Fill the gearbox with new oil up to the oil mark.

         Clear the electrical shutdown

**Activity No 6: 'V' Belt Changing**

         Take electrical isolation (LOTO) (power shutdown or ID Fan shutdown).

         Remove 'V' belt guard.

         Loosen motor foundation bolts and slide the motor on base frame slot

         Remove old belts and replace with new.

         Tighten motor foundation bolts after checking 'v' belt tension and alignment.

         Temporary clear electrical isolation (LOTO) and take trial.

         Take again electrical isolation (LOTO) shutdown for fixing the safety guards.

         Fix safety Guards back.

         Clear electrical isolation (LOTO) and handover.

**Activity No 7: Leveller Checking.**

         Leveler straightness checking

         Measure leveler level with reference to fixed level for every two meters.

         Wing checking

         Take out the leveler about 2.5 meter from hood open leveler wing and check the leveler wing sagging with respect to leveler beam bottom # 10 mm sagging is allowed wings if the wing sag is more than 10 mm replace them with new ones. Wings’ checking is to be done once in a week.

**Activity No 8:    Ram Car Pusher changing**.

         Position car in repair bay.

         Position new pusher in adjacent bay.

         Pusher to be removed out by 2 meters.

         Take electrical isolation (LOTO) for Ram Car. (Pusher drive or Power shutdown)

         Ensure that pusher is cooled enough with water.

* Lock the rack by putting wedges between pinion & rack to avoid horizontal movement during removal of shield

Weld hook for engaging chain block.

         Remove pusher engaging pins.

         Pins if heated to be cooled down to avoid contact.

         Remove pusher out chain block/hydra.

         Temporory clear elctical Isolation (LOTO) and move car to adjacent repair bay.

         Position car and take again take electrical Isolation (LOTO)

         Engage pins with new pusher.

         Clear electrical isolation (LOTO) shutdown & take trial.

**Activity No 9       Charge car -2 cone changing**

         Place Charge car-2 in the Specific location and take work permit from shift in charge.

* Take electrical isolation (LOTO) (power shutdown).

         Remove the vibrator mounted on the cone.

         Remove the bolts of the bottom funnel of the cone.

         Remove the rubber bellow connecting the coal bin and cone.

         Remove the hanger on which cone is mounted.

         While removing the hanger please ensure that the opposite side hangers are removed at a time.

         After removing the hangers, remove the cone.

         Place the bottom funnel first.

         Mount the cone on top of funnel and lift the cone to place the hangers.

         After placing all the hangers insert the rubber bellows in tighten it.

         Place the vibrator in its location.

         Clear the electrical Isolation (LOTO) shutdown and take trials.

Activity No 10:**Leveller changing.**

.     Move car at Repair bay and take electrical isolation (LOTO)

* Remove/ Dismantle leveler wings & cylinder.

.     Clear electrical shutdown and Position car near stack & take electrical isolation (LOTO)

.     Ensure 2 no’s stand of equal height are placed.

.     Pull leveler out using wheel loader till it rest on stand provided.

.     Remove old leveller & position new leveller on stand.

.     Insert new leveller inside slowly using wheel loader

.     Clear electrical shutdown & move car in repair bay.

.     Put leveler wings & cylinder back for operation.

Activity No 11:**Pusher beam  changing**

. Take electrical isolation (LOTO)

. Remove pusher in repair bay and clear electrical isolation

**.** Position car near stack & take shutdown.

**.** .Ensure 2 no’s stand of equal height are placed.

**.** Pull beam out using wheel loader till it rest on stand provided.

**.** Remove old beam & position new beam on stand.

**.** .Insert new beam inside slowly using wheel loader

**.** Temporary clear electrical isolation (LOTO)shutdown & move car in repair bay.

**.** Put pusher on beam.

**.** Clear electrical isolation (LOTO)shutdown for trials.

**Activity No 12: Checking *shrink disc coupling* of charge car 3**

* Take the electrical shutdown of long travel drive or power shutdown.
* With proper tools and tackles check the tightness of the coupling bolts
* Properly tighten the bolts if found loose.
* After completion of the job, ensure that all tools and tackles are removed and no tools are kept on the rails.
* Clear electrical shut down and take the trial.

**Activity No 13: Checking of *L.T. wheels bearing* of all cars**

* Take the electrical shut down for long travel.
* Remove the bearing cover of the wheel to be checked with proper tools and tackles.
* Check bearing for wear marks and lubrication ,
* If Lubrication is not sufficient , then do the lubrication manually with the grease pump.
* After completion of the job, ensure that all tools and tackles are removed and no tools are kept on the rails or battery machine.
* Clear electrical shut down and take the trial.

**Activity No 14: Rectification of *Counter Pressure Roller-Ram Car***

* Position the Ram car in the Repair bay (oven #1 side) and
* Take the electrical shutdown of the machine with lockout system.
* The car to be adequately cooled with water before start of job to the satisfaction of requesting engineer.
* Lift the Pusher beam with the help of the certified Hydraulic jack (25T ).
* Now the counter pressure roller is free from load, adjust the roller as per the requirement and fix it in the position.
* After welding the counter pressure, release the jack and follow the same procedure for the other roller.
* After completion of job, ensure that the all tools and tackles are removed from the site.
* Clear the electrical shutdown and take trial.

**Activity No 15 : Changing of latching cylinders of charge Car 3.**

* Ensure that the charging plate is in the compacting box and CC-3 without charging plate in De-coupled condition.
* Take electrical shutdown of the Machine.
* Shut off the Hydraulic valves of the cylinders from latching powerpack and disconnect the hose pipes from the cylinder end. Close the loose open ends of hose with cotton cloth to avoid contamination
* Remove the fork pin connected to latch arm & 4 bolts of mounting bracket of respective cylinder .
* Replace the cylinders and inform electrical to fix/rectify the external limit switch striker/limit switch if found damaged
* Connect the hoses and normalize the valves
* Clear the electrical shutdown
* Take trial and check for smooth & simultaneous operation of both the cylinders and functioning of limits of coupled/decoupled position.

**Activity No 16: Rail lock mechanism replacement – Charge Car -3**

* Position the Charge car near oven no – 85 for maintenance with unlocking condition of Rail locking system.
* Shift the material, tools and tackles required to area of maintenance
* Take Electrical shutdown & work permit of the activity from the respective shift in charge
* Trained workmen are allowed to execute the job.
* Dismantle the Rail Locking cylinder from the locking system & dress the open ends of Hydraulic hoses with cotton cloth to prevent contamination.
* Dismantle the rail locking system from the structure.
* Replace with new rail locking assembly by ensuring adequate packing with Shims. Between the structure and locking system.
* Assemble the rail locking assembly with the cylinder.
* Connect the hoses back to the cylinder.
* Housekeeping needs be done at the area of repair once the job is done.
* Trials to be  taken, Check for the Rail locking action, piston stroke & smooth movement , gap between the rail and the roller and Oil leakages
* Carry out greasing of all 3 pins of new assembly
* Close the work permit of the activity from the respective shift in charge

**Activity No 17 : Preventive Maintenance**

Preventive Maintenance of HCM, CCM, Pusher machine is covered 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.

` **Procedure for Preventive maintenance**

* Check the preventive maintenance schedule in SAP.
* Take system generated print of generated PM and hand it over to maintenance crew for execution.
* Isolate the machine with proper isolation procedure as per the Vedanta isolation standard.
* 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.
* Ensure all the jobs are completed and in case of any abnormality or pending jobs in the list, a separate notification has to be raised in SAP for ensuring the compliance.
* 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.
* Take trial of machine after job & report abnormality noticed if any.

After completion of PM activity, the generated order needs to be closed within 24 hrs of the execution.

Do’s for all above activites:

All the generated steel scrap generated during the activities is to be shifted to the designated place.

Used cotton waste, hand gloves are to be shifted to the respective bin.

Used oil is to be shifted to the used oil bin.

1. **REFERENCES:**

OEM Manuals & reference drawings

**7. 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. | HI/32 | Hazard Identification | IMS | Soft | 1 Yr. |
| 5. | RA/32 | Risk Assessment | IMS | Soft | 1 Yr. |
| 6. |  |  |  |  |  |

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