1. **PURPOSE:** Instructions for maintenance of Battery machines
2. **SCOPE:** Battery -2
3. **RESPONSIBILITY:** Engineer in charge, 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-HCM, CCM, PUSHER MACHINE & work permit 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.
* 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 : Checking *shrink disc coupling* of all cars

Activity No 2 : Checking of *L.T. wheels bearing* of all cars

Activity No 3 : Rectification of *Counter Pressure Roller-Pusher Machine*

Activity No 4 : *Gear Box Oil changing* for all battery machines

Activity No 5 : Replacement of *Latching cylinders-CCM*

Activity No 6 : *Greasing* of charging Drive Wheels – CCM

Activity No 7 : Drive Chain replacement-CCM

Activity No 8 : Drive Motor replacement-CCM

Activity No 9 : Pusher shield replacement(Roller design) *-Pusher Machine*

Activity No 10 : *Support roller* replacement-CCM

Activity No 11 : Charging machine *plate drive overhauling & inspection*

Activity No 12 : Rail lock mechanism replacement-CCM

Activity No 13 : Drive Motor replacement-Pusher machine

Activity No 14 : Drive Gearbox replacement-Pusher machine

Activity No 15 : 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:**

**Procedure**

**Activity No 1: Checking *shrink disc coupling* of all cars**

* Take the electrical shutdown of long travel drive.
* 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 2 :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 3 :Rectification of *Counter Pressure Roller-Pusher Machine***

* Position the Pusher Machine in the Repair bay (oven no. 75 side).
* 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 4 : Gear Box Oil changing for all battery machines**

* Take electrical shutdown with lock out system.
* Remove drain plug to drain old oil in container.
* Flush gearbox with old oil to remove any foreign particles.
* Check gear teeth.
* Put the drain plug back and tighten the same fully.
* Top up with new oil up –Omala 320 to the oil mark and check overflow of oil from 90 deg overflow port.
* Clear the electrical shutdown.
* Removed oil should be stored in the Waste oil Barrel as used oil.

**Activity No 5 : Changing of latching cylinders of charging Machine.**

* Ensure that the charging plate is in the compacting box and CCM 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 6 : Greasing of charging Drive Wheels – Charging machine**

* Place the charging drive in the position convenient for greasing of all four wheels ( 1.5 m away from extreme rear home position)
* Take electrical shutdown with lock out system
* Grease the wheels with the help of the grease pump unless and until the grease oozes out.
* After completion , ensure all tools and tackles are removed
* Clear the electrical shutdown.

**Activity No 7 : Drive Chain replacement - Charging machine .**

1. Position the charge car near stack-2B with charging plate in de-coupled state.
2. Take electrical shutdown & work permit for job on Charge car.
3. Decouple the drive sprocket from gearbox output coupling.
4. Remove the inspection covers of sprocket on either sides .
5. Unfasten the end locknut of the chain & split pin on oven side and stack side.
6. Completely remove the old chains one after other & gently shift it on plate.
7. Check and count the no of links in old chain & new chain. Match the no of links in new chain before installation by cutting excess links if required.(117 links should be there in chain)
8. Check for missing/dislodged square bar & fix it before proceeding further
9. Check for bolt tightness of drive sprocket mounting bolts
10. Place the new chain & roll it over the sprocket teeth & pull the chain from oven side end.
11. Lock the end of chain in position with lock nut & split pin.
12. Repeat S.No e-j for the other chain.
13. Couple the sprocket & drive.
14. Clear electrical shutdown & Clear work permit.
15. Take trial by moving the drive back and forth at plate handler stand for smooth operation, drive moving in straight line on rails.

**Activity No 8: Drive Motor replacement -Charging machine latching drive**

* Place the charge car near compacting station (- 3 location).
* Take electrical shutdown of Charge car & CCM DSL
* Take work permit for the job.
* Decouple the motor & gear box coupling
* Position the F-15 Crane on powerpack side
* Remove the old motor with 15T crane
* Place the new motor in position with crane
* Couple the motor & gearbox & carryout alignment.
* Clear electrical shutdown & Clear work permit.
* Take trial

**Activity No 9 : Pusher shield replacement (Bottom Roller design)\_Pusher machine**

* Position the Pusher machine near location-75
* Take the Pusher shield away from machine towards ground pusher without touching the door stand
* Take electrical shutdown & work permit
* The car to be adequately cooled with water before start of job to the satisfaction of requesting engineer.
* Lock the rack by putting wedges between pinion & rack to avoid horizontal movement during removal of shield
* Suspend the old pusher shield by holding with 15T crane and remove the 2 mounting vertical pins( connecting rack beam and shield).
* Remove and park the old shield at safe location
* Install the new pusher shield using F-15 crane and insert the 2 pins firmly
* Check for front face of shield , should be perpendicular to ground
* Clear electrical shutdown & take trial in empty oven for travel of rack for 3 mts.
* Clear work permit

**Activity No 10 : Support roller replacement – Charging machine**

* Position the charge car near new Hydraulic compacting station at -6 location without charging plate and keep the latching drive at extreme rear position.
* Take electrical shutdown of Charge car.
* Take work permit for the job.
* Check & remove the old support rollers that are not rolling with hand
* Make use of certified 2T chain block to lift & lower the rollers
* Replace with new rollers
* Clear electrical shutdown & Clear work permit.

**Activity No 11: Charging machine - Plate drive overhauling & inspection**

* Place the charge car near -3 location.
* Take electrical shutdown of Charge car.
* Take work permit for the job.
* Remove covers of charging drive sprocket & check for bolt tightness
* Replace oil of gear box with Omala 320
* Clear electrical shutdown & Clear work permit.

**Activity No 12: Rail lock mechanism replacement – Charging machine**

* Position the Charge car near oven no – 34 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.
* Remove the proxy limit switches with help of Electrical department
* Dismantle the Rail Locking cylinder from the locking system with help of certified 2T chain block & 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 and proximity sensor 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 13: Drive Motor replacement-Pusher machine**

* Position the Pusher machine near location-75
* Take electrical shutdown & work permit for the job
* Lock the rack by putting wedges between pinion & rack to avoid horizontal movement.
* Car to be adequately cooled to satisfaction of requesting user department before start of job.
* Remove the roof top sheets & associated purlin above the gearbox & motor in line of action for removal with F-15 crane
* Decouple the motor & Gearbox and loosen the foundation bolts of motor
* Remove the motor slowly & vertically using crane and park at safe location
* Install the new motor using F-15 crane and couple with gearbox
* Carry out alignment and record the readings
* Restore the roof top sheets & refix the roof purlins
* Clear electrical shutdown & take trial in empty oven for travel of rack for 3 mts.
* Clear work permit

**Activity No 14 : Drive Gearbox replacement-Pusher machine**

* Position the Pusher machine near location-75
* Take electrical shutdown & work permit for the job
* Lock the rack by putting wedges between pinion & rack to avoid horizontal movement.
* Car to be adequately cooled to satisfaction of requesting user department before start of job.
* Remove the roof top sheets & associated purlin above the gearbox & motor in line of action for removal with F-15 crane
* Decouple the pinion & Gearbox by removal of all coupling bolts
* Remove gearbox mounting bracket bolts
* Remove the gearbox slowly & vertically using crane and park at safe location
* Install the spare new gearbox using F-15 crane and couple with pinion shaft half coupling
* Carry out alignment and record the readings
* Clear electrical shutdown & take trial
* Clear work permit

**Activity No 15 : 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.

1. **REFERENCES:**

OEM Manuals & reference drawings

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 | HI/59 | Hazard Identification | IMS | Soft | 1 Yr. |
| 5 | RA/59 | Risk Assessment | IMS | Soft | 1 Yr. |

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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** |