**1.0 Purpose : -** Maintenance of Crane in safe way for optimum performance

2.0 **Scope**: All EOT cranes

3.0 **Responsibility** : Engineer In charge and workmen on the job

4.0 **Procedure** : **MAINTENANCE OF EOT CRANE**

* **PPE’s to be used : -**Helmet, Safety shoes, Dust mask, safety goggle, ear plug and full body safety harness (while working at height).
* **Activity No 1 : - Crane coupling checking/changing**
* **Activity No 2 : - Crane gear box/motor/ drum replacement**
* **Activity No 3 : - Crane wire rope changing**
* **Activity No 4 : - Crane hook changing**
* **Activity No 5 : - Wheel assembly changing**
* **Activity No 6 : - Wheel assembly overhauling**
* **Activity No 7 : - Bearing lubrication**
* **Activity No 8 : - Visual inspection of cranes**
* **Aspect – impact** **: -**

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| Oil Spillage | : Land contamination & Resource Depletion |
| Dust Generation | : Air pollution |
| Oil traced waste generation | : Land contamination & Resource Depletion |

* **Hazards identified : -**

**Mechanical Hazard**

1. Fall of person from height.

2. Fall of person in hot sinter pallet car, running conveyor, screen.

3. Slipping of person in dust or grease.

4. Trapping of person during the fall of material from crane height.

5. Trapping of person between crane wheel/ structure and rail.

6. Trapping of hand between the brake assembly gap.

7. Hitting/trapping of person between two cranes or between crane and structure.

8. Hitting of person by crane while moving (standing on crane or while standing in walkway).

9. Trapping of hand/ other part of body while handling the material or equipment.

10. Hitting/ trapping of person by material being lifted by external crane/ hydra.

11. Hitting of ladle or hook while shifting / crane moving.

12. Fall of material from top.

13. Fall of spanners, tools, plate, angles, open wire rope while lifting rope, steel etc.

14. Fall of equipment like gearbox, motor etc. while installation.

15. Failure of wire rope/sling while lifting wire rope, gearbox, motor, steel etc.

16. Failure of wire rope/ hook of external crane/ Hydra used for material/ equipment erection.

17. Failure of lifting machines, handling machines such as chain pulley block, sling, D shackle etc.

18. Back Pain due to sudden or heavy load like gear boxes, drums & motors etc.

19. Nonuse of PPE’s while carrying out the activity.

20. Alcoholism.

21. Trapping.

22. Failure of crane hook and hook coming out due to lock plate failure or loosening.

23. Structural failure in crane.

24. Hitting of moving machineries like crane, truck, wheel loader etc while reversing or taking forward

25. Failure of brake, gear & couplings.

26. Failure EOT crane wire rope

27. Impact of other moving EOT cranes which are in operation on the crane under maintenance

28. Slip or fall or any accidents on account of poor visibility due to steam from mould cooling or slag granulation

29. Fall or slip of crane while jacking

30. Incident due to improper identification of cranes or drives

31. Fall of person through the gate provided for entering into crane

32. Accident due to improper operation or wrong signaling

33. Accident due to faulty operation of remote.

34. Accident due to operation from other operating points

35. Trapping of fingers in brake

36. Trapping of fingers between rope and rope drum

37. Failure of manila rope used for lifting the wire rope

38. Fall of wire rope while lifting the wire rope or any other items due to improper tying or negligence of person holding it

**Physical Hazard**

1. Fire.

2. Graphite and dust falling in eyes.

3. Exposure to hot metal/sinter splatters.

1. Exposure of person to hot slag granulation water.
2. Exposure to slag granulation or PCM fumes.
3. Hitting of bearing pieces.
4. Impact of chips in eyes or any body part while working near PCM area
5. Burn injury from hot metal splashing or spillage
6. Explosion of hot metal
7. Fire of lubricating compound

**Chemical Hazard**

1. BF Gas
2. **LPG**

**Electrical Hazard**

1. Electrical shock.
2. Electric shock due to DSL bars.

**General guide lines**

1. Take shutdown of DSL when ever working in the vicinity of DSL
2. Take clearance from production department (verbally). Obtain the shutdown clearance from Electrical Department.
3. Cordon the full area at the ground, which is coming under the approach of the crane. Ensure that dismantled hardware are handled carefully to avoid fall from height.
4. Empty or fill the oil to gearbox as per requirement with care to avoid spillage. Use oil tray to avoid any oil spillage on ground.
5. After completion of the job restore all safety guards, take electrical clearance and complete the restoration of equipment as per shut down procedure.
6. Return back all waste oil to store for proper disposal/recycling.
7. Carry out housekeeping as per the procedure . No loose material to be kept in cranes or platforms
8. Refer WI/MAINT/12 & SP 44 for material handling
9. Refer WI/MAINT/ 94 for fabrication and erection jobs
10. Refer VL/IMS/VAB/SP44 B

**Activity No 1: Crane Coupling Checking/ Changing**

A. Take electrical shutdown of the crane & follow isolation procedure

B. Remove the coupling guard and de couple the coupling.

C. Check the coupling teeth on the hub and flange for wear out.

D. Check the coupling for looseness on shaft and keyway.

E. If the teeth have sharpened or coupling found loose on shaft, then change the coupling.

F. Remove the coupling using the coupling puller.

G. Take the actual dimension of the shaft and machine the coupling internal bore as per these dimensions.

H. Fit back coupling along with the key

I. Fit back motor to the position.

J. Align the coupling axis of motor and gearbox.

K. Fill grease in the coupling and couple the coupling. Take due care to avoid any spillage of grease on ground.

L. Clear the electrical shutdown as per shutdown procedure and take trials.

M. Take the trial of the same for forward / reverse direction and Hoisting / lowering.

N. Following additional cares must be taken while checking the coupling in running cranes:

- Take electrical shutdown and tighten the bolts. Never ever t loosen the coupling bolts when crane is loaded with material

- Close co-ordination with crane operator and engineer in charge is essential while going into crane during running

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**Activity No 2 : Crane Gearbox/Motor/ Rope Drum Replacement**

1. Take clearance from production department (verbally). Obtain the shutdown clearance from Electrical Department .
2. Remove the coupling guard and decouple the coupling to isolate drive and driven unit.
3. Ensure the proper slinging of motor on hooks, gear box & drum etc.
4. Remove the foundation bolt of motor/gear box/ rope drum.
5. Lift and lower the gear box/ motor/rope drum using chain block/external crane. Follow procedure of material handling for application ([WI/MAINT/12](http://sgl-panj-sp-01:8080/../../../../Dipesh/balkrishna/Local%20Settings/Temporary%20Internet%20Files/Content.IE5/departmental%20manual/11%20%20Work%20instruction/WIMAINT12%20MATERIAL%20HANDLING%20.doc)).
6. Fit back new overhauled gear box/ motor to the position
7. Align the driving and driven unit.
8. Couple the drive and driven unit. Fix the coupling guard back to position.
9. Take the trial of the unit.

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**Activity No 3** : **Wire Rope Changing**

1. Take clearance from production department (verbally). Obtain the shutdown clearance from Electrical Department .
2. Barricade the area under the crane with WORK IN PROGRESS TAPE.
3. Get the lower limit switch by passed by electrical engineer/electrician.
4. Lower the hook fully on ground till the hook becomes horizontal on ground.
5. Continue lowering the wire rope till only 2 round of rope is remaining on the rope drum
6. Take electrical shutdown of the crane.
7. Remove the clamps on the wire rope drum.
8. Lower the wire rope on the ground ensuring no person standing under the crane.
9. Start laying the wire rope as per the respective General Arrangement Drawing.
10. Make sure that the wire rope is passed through the gravity limit switch.
11. Clamp the ends of wire rope properly on rope drum.
12. Apply wire rope lubricant if necessary.
13. Clear electrical shutdown and also remove by pass of lower limit switch.
14. Take trial by lifting and lowering
15. Ensure that the limit switches are working.

**Activity No 4: Crane hook changing**

For removing 20T, 32T, 5T hook

1. Take clearance from production department (verbally).
2. Lower the whole hook on the ground.
3. Obtain the shutdown clearance from Electrical Department .
4. Remove the locking arrangement of the hook.
5. Separate the hook from the assembly.
6. Position the new hook so that locking pin passes thought the hole.
7. Ensure that the hook is tightened fully in the nut and the top faces of hook & nut are in same level.
8. Also ensure that the locking plate passes through the groove on hook as well as on nut and lock nuts are tightened fully
9. Take the trial of hook by lifting suitable load .
10. Hoist the wire rope fully.
11. Ensure that the hook snatch box or pulley block or grab bucket will not touch the crab.
12. Clean the graphite accumulate on the drum with cotton cloth
13. Apply the lubricant with brush.
14. Once the lubricant is applied rotate the drum and apply it on other side of the drum.
15. Lower the wire rope and apply lubricant on the rope drum and again wind the rope so to apply the lubricant on the other side of wire rope.

**Activity No 5: Wheel Assembly Changing** .

1. Take electrical shutdown of the crane.
2. Weld or bolt stopper angles to ensue slip or movement of crane during jacking operation
3. Use jack of suitable capacity and lift the wheel above the track.
4. Ensure that the wheel is not lifted more so that the crane may slide out of the track. Fix side stoppers for crane structure to avoid slide out of the track
5. Fix support under the lifted crane structure and remove the jack. Care should be taken while placing the wheel for trapping and fall of wheel due to unbalance or improper slinging
6. Remove the bearing block foundation bolt and pull out the wheel assembly.
7. Clean the key bar with chisel and emery paper.
8. Place new wheel assembly in place and bolt the assembly in position.
9. Ensure that the key bar enters the grooves on the bearing block.
10. Put bearing block foundation bolts and tighten.
11. Rotate and check the wheel for freeness.
12. Again jack the crane and remove the support.
13. Lower the jack so that the wheel takes the load of the crane.
14. Fully tighten the foundation bolts,
15. Again jack the crane wheel and check the wheel for freeness
16. Lower and remove the jack
17. Clear the crane shutdown and handover to production.

**Activity No 6: Wheel Assembly Overhauling.**

1. Shift the wheel assembly to any safe working place.
2. Clean the assembly with cotton rag/waste.
3. If the assembly is drive wheel, remove the coupling with coupling puller or by pressing the assembly on hydraulic press.
4. While putting the wheel assembly on press, take care that the wheel should held and not the bearing block as the bearing block may turn and the wheel may fall.
5. Also tie a manila rope for lifting the wheel if the weight of the wheel assembly is more.
6. Remove the bearing covers and the bearing block.
7. Clean the bearings with bearing cleaner.
8. Check for any damage of bearing
9. Remove the bearings with 3 jaw puller/ pressing it on hydraulic press.
10. Check the shaft/wheel for any damages.
11. Check the fitting and keyway between shaft and wheel.
12. If shaft is found damaged repair/replace the shaft/wheel.
13. Replace the bearings if found damaged.
14. If bearings are pressed on hydraulic press, take care that bearings are not pressed more as the bearing may break and the bearing pieces may fly off injuring the nearby workmen.
15. Fit the bearing block.
16. Check the freeness of bearing assembly.
17. Fill grease in the bearings.
18. Put bearing covers and fit the coupling.
19. Shift the assembly back to the storage area.

**Work No 7: Bearing Lubrication**

1. Take clearance from production department (verbally). Obtain the shutdown clearance from Electrical Department.
2. Fill grease in grease pump.
3. Clean the bearing block with cotton rag.
4. Pump the grease in all the CT and LT wheel bearings.
5. Once the greasing is complete clean the bearing block with cotton rag.

**Activity No 8: Visual inspection of cranes**

1. Inform the concerned operation in charge (O&M staff) about the visual inspection to be carried out by clearly indicating the time needed to carry out the activity.
2. “A” shift O & M mechanical engineer shall accompany the checklist technicians/fitters
3. It is mandatory that two technicians/ fitters carry out the checklist inspection.
4. Request the crane operator to keep the crane at entry of walkway and hand over the key of access gate to the technician proceeding to carry out the inspection.
5. Now, the technician should lock the main gate available on the stair case and proceed to the crane.
6. Open the gate of the crane girder & keep it OPEN. This will disable the crane controls as the limit switch attached to the crane gate will get activated.
7. Carry out visual inspection of the crane as per checklist.
8. If anything found abnormal, inform the crane operator and In-charge of operation. If the abnormality needs to be attended immediately, inform the operator not to operate.
9. Once inspection is done, hand over the keys to the Operator & give clearance to the Operation in charge.

**Reference: -** Suppliers Manuals and maintenance procedure

**Amendement Record**

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| **Date** | **Manual Section Ref. & Para** | **Brief details of Revision** | **New Rev.** |
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| **Prepared By:**  Associate Manager- Sinter Plant Mechanical | **Reviewed & Issued By:**  Management Representative | **Approved By:**  **Manager- Mechanical PID2** |
| **Signature:** | **Signature:** | **Signature:** |
| **Review Date: 10.08.2022** | **Review Date: 10.08.2022** | **Review Date: 10.08.2022** |