**SOP FOR**

**1.0 Purpose : -** Safe Maintenance of PMD & SMD for Optimum performance.

2.0 **Scope**: Sinter plant.

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

4.0 **Procedure** : **MAINTENANCE OF PMD & SMD (Primary mixing drum and secondary mixing drum)**

**PPEs to be used**

Helmet, Safety shoes, hand gloves, ear plug, Dust mask and safety goggle.

**Work No 1 Replacement of Gear box**

**Work No 2 Replacement of tyre assembly (For DE side)**

**Work No 3 Replacement of tyre assembly (For NDE side)**

**Work No 4 Replacement of thrust roller**

**Work No 5 Replacement of drum liners.**

**Work No 6 Replacement of hanging pipe wire rope.**

**Work No 7 Replacement of Steam pipeline inside drum.**

**Work No 8 Replacement of water pipeline inside drum.**

**Work No 9 Inspection of Plummer block greasing lines**

**Aspect - impact**

Dust Generation Resource Depletion

Scrap generation Air pollution

**Hazards identified**

**Mechanical hazard:**

1. Inhaling of dust.
2. Fall of material.
3. Failure of sling, chain pulley block, beam, over travel of trolley , improper hooks welding.
4. Entrapping between tyre, drum, supports, etc
5. Slip of tyre from jacking position
6. Slip of supports/jacks due to improper loading and improper tools
7. Fall of person from height
8. Failure of crane
9. Rolling back of drum due to improper load/jack position/release of sling/ support
10. Fire.

**Electrical hazard**

Electrical shock in welding,

**Procedure**

Work No 1: **Replacement of Gear box.**

1. Remove roof sheets to facilitate gear box removal after taking work permit. Follow safety procedure-------- for working in sheet. (Only for SMD)
2. Take clearance from production in charge and obtain the shutdown clearance from Electrical Department with LOTO. Take additional s/d of conveyers before and after drum.
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. Confirm there is no roll back of drum by putting a wooden block between tyres and drum. (this is an important check before de-coupling drives)
5. First remove the input and output side pinion guard by removing bolts.
6. Decouple input coupling after marking coupling position. Keep the bolts in a specified location to avoid misplacement.
7. Drain the oil from lubrication box.
8. Remove lubrication box of pinion and gear.
9. Remove all foundation bolts of gear box; keep shims/packings at proper position duly marked.
10. Remove outside jacking bolts by cutting for facilitate gear box shifting towards outside.
11. Pull the gear box outside the drum coverage by using chain pulley.
12. Sling the gearbox through the holes provided on the top cover of gearbox. Ensure proper slinging and balanced hoisting.
13. Lift gearbox by using chain block / hoist/crane, whichever is convenient. Use tested tools and tackles and duly inspected before use
14. Clean the base of the gear box, removing the shims one by one in a set and repositioned the shims/packings again.
15. Place the overhauled/new gearbox in position by using chain block / hoist/crane, whichever is convenient and align the output pinions (by maintaining proper backlash and root clearance) first and then input drive.
16. Tighten the foundation bolts of gearbox with spanner. Use HT bolts of required length
17. Couple input side coupling.
18. Check the oil level of the gear box (This has to be done before the starting of the job), (SP320).
19. Fix lubrication box of pinion and gear.
20. Refill the oil in lubrication box (Used oil).
21. Fix the coupling guards in position and tighten all bolts
22. Remove the wooden block that was inserted in between drum and tyre for locking (this is an important check after coupling drives)
23. Clear electrical shutdown and start the drum in manual mode to take trials.
24. Run the motor with gear box, ensure normal operation by checking motor parameters, and gear box for noise, vibration, and temperature
25. Hand over the equipment to Production dept.
26. Monitor the performance for next 24 hrs at every 2 hrs

**Work No 2**: **Replacement of tyre assembly (For DE side)**

1. Take clearance from production in charge and obtain the shutdown clearance from Electrical Department with LOTO.
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. Lift the drum by 50-100 mm (drum wt.PMD 20t & SMD 24t) at both ends by using tested hydraulic jacks (50 / 100 ton). Use proper saddle for taking load of the lifted drum and lock and release the jack Use standard fixtures above jack to avoid slip hazard.
4. First remove the guards by removing bolts.
5. Decouple, coupling connected to tyre assembly to be removed. Mark coupling position to avoid mismatching.
6. Remove all bearing block mounting bolts of tyre assembly to be taken out.
7. Pull out the tyre assembly using chain block (5 ton) and hoist.
8. Lift & take out tyre assembly by using chain block / hoist at the ground floor.
9. Remove coupling / sprocket connected to tyre assembly with hydraulic jack and puller.
10. Remove all bearing cover bolts of tyre assembly
11. Remove bearings of tyre assembly by using proper hydraulic jack and puller. Never hammer the bearings as its loose part may hit our body
12. Remove tyre disc bolts & release tyre from assembly. The tyre may rotate when placed simply and cause accident.
13. Replace new tyre with disc. Ensure all tyre diameters are same.
14. Install bearing in position, check bearing clearance before installation and change if damaged)
15. Clean the Plummer blocks.
16. Assemble the plummer block by tightening the bolts.
17. Refit the coupling / connected to tyre assembly
18. Place the Tyre assembly in position and align the coupling.
19. Tighten the plummer block bolts.
20. insert coupling pins & cover plate’s bolts to be tighten properly.
21. Refit outside jacking bolts by welding.
22. Jack the drum and remove lock and saddle. Then gradually release the jack.
23. Fix the guards in position and tighten all bolts
24. Clear electrical shutdown and start the equipment in manual mode to take trials.
25. Check the vibration, any abnormal sound, temperature.
26. Check the current of the motor in no load and load.
27. Hand over the equipment to Production dept.

**Work No 3**: **Replacement of tyre assembly (For NDE side)**

1. Take clearance from production in charge and obtain the shutdown clearance from Electrical Department with LOTO.
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. Lift the drum by 50-100 mm (drum wt.PMD 20t & SMD 24t) at both ends by using tested hydraulic jacks (50 / 100 ton). Use proper saddle for taking load of the lifted drum and lock and release the jack Use standard fixtures above jack to avoid slip hazard.
4. First remove the guards by removing bolts.
5. Remove all bearing block mounting bolts of tyre assembly to be taken out.
6. Pull out the tyre assembly using chain block (5 ton) and hoist.
7. Lift & take out tyre assembly by using chain block / hoist at the ground floor.
8. Remove all bearing cover bolts of tyre assembly
9. Remove bearings of tyre assembly by using proper hydraulic jack and puller. Never hammer the bearings as its loose part may hit our body
10. Remove tyre disc bolts & release tyre from assembly. The tyre may rotate when placed simply and cause accident.
11. Replace new tyre with disc. Ensure all tyre diameters are same.
12. Install bearing in position, check bearing clearance before installation and change if damaged)
13. Clean the Plummer blocks.
14. Assemble the plummer block by tightening the bolts.
15. Place the Tyre assembly in position and align
16. Tighten the plummer block bolts.
17. Refit outside jacking bolts by welding.
18. Jack the drum and remove lock and saddle. Then gradually release the jack.
19. Fix the guards in position and tighten all bolts
20. Clear electrical shutdown and start the equipment in manual mode to take trials.
21. Check the vibration, any abnormal sound, temperature.
22. Check the current of the motor in no load and load.
23. Hand over the equipment to Production dept.

**Work No 4**: **Replacement of thrust rollers**

1. Take clearance from production in charge and obtain the shutdown clearance from Electrical Department with LOTO.
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. Remove base bolts and stud nut.
4. Put the thrust roller on a stool and remove the stool along with thrust roller outside.
5. Put the new thrust roller on the stool and slide it to the position.
6. Fix the stud and align the thrust roller.
7. Tighten the base bolts and stud nut.
8. Do housekeeping of the area
9. Release the shutdown and take trial. Hand over to operation

**Work No 5 : Replacement of drum liner**

1. Take clearance from production in charge and obtain the shutdown clearance from Electrical Department with LOTO (SMD,H2 CONVEYOR).
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. Ensure that the drum is thoroughly cleaned.
4. Lock the drum in position by putting wooden block between tyres and drum.
5. Remove the locking nut of the liner plate.
6. Remove the locking angle.
7. Remove the liner plate.
8. Clean the drum inside.
9. Weld the stud to the drum.
10. Fix the liner and locking angle and tighten the lock nut.
11. Remove the wooden block that was inserted in between drum and tyre for locking
12. Do housekeeping of the area
13. Release the shutdown Hand over to operation.

**Work No 6 : Replacement of hanging pipe wire rope.**

1. Take clearance from production in charge and obtain the shutdown clearance from Electrical Department with LOTO (SMD,H2 And Z-1 CONVEYOR,PUMP,STERM MAIN VALVE ).
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. Ensure inside temperature normal before starting the job.
4. Lock the drum in position by putting wooden block between tyres and drum.
5. Fix the supporting piece of hanging pipe.
6. Loosen the turn buckle and remove the wire rope.
7. Fix the new wire rope and tightened the turn buckle.
8. Lock the wire rope by bull dog clamp minimum 3nos.
9. Remove the support and clear the material inside the drum.
10. Remove the wooden block that was inserted in between drum and tyre for locking
11. Release the shutdown Hand over to operation.

**Work No 7 : Replacement of Steam pipeline inside drum.**

1. Take clearance from production in charge and obtain the shutdown clearance from Electrical Department with LOTO (SMD, H2 and Z-1 CONVEYOR,PUMP STEAM MAIN VALVE).
2. Ensure inside temperature normal before starting the job.
3. Steam should be drained fully, by drain valve.
4. Lock the drum in position by putting wooden block between tyres and drum.
5. Loosen the turn buckle and remove the wire rope.
6. Cut and remove the pipe.
7. Fix the new pipe by welding/flange joint.
8. Lock the wire rope by bull dock clamp minimum 3nos.
9. Remove the wooden block that was inserted in between drum and tyre for locking
10. Release the shutdown Hand over to operation.

**Work No 8 : Replacement of water pipeline inside drum.**

1. Take clearance from production in charge and obtain the shutdown clearance from Electrical Department with LOTO (SMD, H2 AND Z-1CONVEYOR, WATER VALVE/PUMPS, STEAM MAIN VALVE).
2. Ensure inside temperature normal before starting the job.
3. Water should be drained fully.
4. Lock the drum in position by putting wooden block between tyres and drum.
5. Loosen the turn buckle and remove the wire rope.
6. Cut and remove the pipe.
7. Fix the new pipe by welding/flange joint.
8. Lock the wire rope by bull dock clamp minimum 3nos.
9. Remove the wooden block that was inserted in between drum and tyre for locking
10. Release the shutdown Hand over to operation.

**Work No 9 : Inspection of Plummer block greasing lines**

1. Take clearance from production in charge and obtain the shutdown clearance from Electrical Department with LOTO (SMD/PMD).
2. Open the grease point end of tyre plummer block and manually operate the grease point.
3. Inspect the grease flow

**Case 1 – if grease is not flowing**

1. Open the grease point at pump end and check for flow
2. Clean and clear the line using air and refit, manually operate the grease point to ensure grease is flowing and is received at plummer end.
3. Refix the grease point at plummer end

**Case 2 – if grease is flowing**

1. Refix the grease point at plummer end
2. Continue the above procedure for remaining plummer blocks.
3. Release the shutdown Hand over to operation.

**DOs-**

Use 24 V hand lamp while working

Use certified safety harness

Use scaffolding to work at height

Use bearing heater

**DON’Ts**

Use plates / loose material for jacking support

Use uncertified tools, slings, jacks

Use bari for locking moving item

Try to remove tyres/ assembly when it is in loaded condition (even empty drum)

Use fire for oil bath

**Reference: -**

**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: 29.06.2022** | **Review Date: 29.06.2022** | **Review Date:** |