**SOP FOR BLOWER MAINTENANCE**

* **PURPOSE: Maintenance of Blowers & its related equipment in safe way for optimum performance.**
* **SCOPE:** **Blast furnace 3 Blowers.**
* **RESPONSIBILITY: Engineer In charge and workmen on job.**
* **PROCEDURE: MAINTENANCE OF BLOWERS & ITS RELATED EQUIPMENT.**

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PPE”S

* Helmet, Safety shoes, Cotton cloth, Ear plugs, Ear muffler and safety goggle (Depending upon the type of job), hand gloves
* Work No 1 : Decouple & Coupling of blowers
* Work No 2 : Oil indicator replacement
* Work No 3 : Check valve (Overhead oil tank line) replacement
* Work No 4 : Check valve (Lube. Oil pump) replacement
* Work No 5 : Lube Oil pump replacement
* Work No 6 : Bearing replacement of blower
* Work No 7 : Flushing of Heat-exchanger of Lube Oil tank
* Work No 8 : Filter cleaning of Lube Oil tank
* Work No 9 : Rotor Assembly replacement
* Work No 10 : Suction Air filter replacement
* Work No 11 : Emergency blower maintenance.
* Work No 12 **:** Emergency blower valves & NRV replacement/Maintenance.

**Aspect – Impact**

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| --- | --- |
| Scrap generation | Resource Depletion |
| Oil Spillage | Land contamination & Resource Depletion |
| Noise Generation | Noise pollution |
| Oil traced waste generation | Land contamination & Resource Depletion |

**Hazards identified**

Physical Hazard - Noise, vibration, pressure, temperature

Mechanical Hazard - Trapping between two objects,

Fall of material, hammer, tools, slinged items, bolts

Fall of person from platform, duct

Impact of moving / slinged items

Electrical hazard - Shock in welding

Behavioral Hazard - Alcoholism,non-usage of PPE’s, Casual approach while working.Non usage of correct tools,Horseplay

**Mandatory instructions:**

* Take work permit from the Shift Superintendent / Control room In charge after taking all related safety indicated in the work permit list.
* Take counter sign in Work permit from Blower operator
* Obtain the shutdown of equipment (LOTO) main **blower motor as well as Barring gear motor** from Electrical Department Obtain shutdown of both the oil
* Use ear muffler while working in the blower house area where sound level is above 85 db.
* Ensure that the discharge valve is closed of the blower on which maintenance activity is carried out.
* Ensure blower rotation is stopped before start of any work in fan

**Work No 1: Decouple & coupling of blowers**

* Decouple the main motor and barring gear; or barring gear and fan assembly as per the requirement. Keep the bolts in proper place to avoid misplacement.
* Take the help of 32/5T blower house crane for removing the coupling guards. Use tested slings and D shackles which has SWL higher than load to be lifted.
* Use cutting set if bolts are very tight. Use procedure SP 44 for usage of cutting set.
* Ensure that accumulated oil in coupling guard is drained before going for gas cutting.
* Decouple the coupling with the help of required spanners. 32/5T blower house crane to be used for holding & removing the distance piece of the coupling which is to be removed.
* After the required work is completed, it has to be coupled back. Check for correct match punch mark, Count the spacer shims between coupling and keep it separately for each side (keep record to avoid future confusion)
* With the help of 32/5T blower house crane, fix back the distance piece of coupling. Couple back by tightening the bolts. Apply equal torque on all bolts with torque wrench.
* Fix back the coupling guards using the 32/5T blower house crane
* Tighten all base bolts of the coupling guard. .
* Rotate the barring gear manually to check the rotation
* Before clearing shut down ensure that 32/5 EOT crane is moved away to parking zone.
* Clear electrical shutdown of all the equipment’s as per shutdown procedure.
* Clear the work permit
* Monitor blower vibration, current, flow, bearing temp and air leakages for one day if the blower is taken inline

**Work No 2: Oil indicator replacement**

* Ensure that the oil is drained completely from the pipeline by gravity and the line is empty.
* Follow procedure for handling oil
* Place a tray below the position of the glass indicator which is to be replaced
* Remove the bolts holding the glass indicator carefully. Before this drain the tank up to lower part of oil gauge.
* Slightly push the oil line while holding the glass indicator. Once gap is achieved, remove the glass indicator.
* Fit the new glass indicator properly by pushing the oil line slightly to create gap.
* Put the bolts back and tighten it carefully. Clear the shutdown of the Lube. Oil pumps and start one of the pumps to check if any leakage is there.
* After the job is completed, stop the pump. Remove the tray and do the necessary housekeeping.
* Give clearance to production department and blower operator.

**Work No 3: Check valve (of the overhead oil tank) replacement**

* Ensure that Lube. Oil pump shutdown is taken & there is no oil left to be drained in the return oil line of the overhead tank.
* Place a tray below the position of the check valve which is to be replaced
* Remove the bolts of the check valve carefully. Slightly push the pipeline to create gap, and remove the check valve.
* Insert the new check valve by creating a slight gap between the pipeline.
* Check for proper seating of gasket & proper cleaning of flange surface
* Tighten all the bolts carefully.
* Clear the shutdown of the Lube. Oil pump and take trials to check if any leakage is there.
* Accordingly adjust & tighten the bolts.
* After the job is completed, remove the tray & do the necessary housekeeping.
* All oil traces on the floor to be cleaned.

**Work No 4: Check valve (Lube. Oil pump) replacement**

* Ensure that Lube. Oil pump shutdown is taken
* Place a tray below/at the sides of the position of the check valve which is to be replaced
* Remove the bolts of the check valve carefully. Slightly push the pipeline to create gap, and remove the check valve
* Insert the new check valve by creating a slight gap between the pipelines.
* Check for proper seating of gasket & proper cleaning of flange surface before activity D.
* Tighten all the bolts carefully.
* Clear the shutdown of the Lube. Oil pump and take trials to check if any leakage is there.
* Accordingly adjust & tighten the bolts.
* After the job is completed, remove the tray & do the necessary housekeeping.

**Work No 5: Lube. Oil pump replacement/maintenance**

* Take the shutdown of the Lube. Oil pump to be replaced
* Place a tray below the flanges of discharge line of pump & remove the discharge line.
* Loosen & remove the motor foundation bolts.
* With the help of 32/5T blower house crane, decouple and remove the motor
* Remove the bolts of the pump’s base plate bolts
* With the help of 32/5T crane, lift the pump & remove it from the oil tank. Use proper D-shackles &web slings to lift the pump
* Keep the pump on a clean place or on some cleaned packing material (cardboard sheets) for maintenance/overhauling
* If new pump is to be fixed, then same procedure to be followed as followed during dismantling, i.e. with the help of 32/5T crane using proper D-shackles & web slings, lift the new/overhauled pump and place it onto the position on oil tank.
* Fix & tighten the bolts of its base plate on the tank
* If the same removed pump has to be fixed back, then the tank portion from where the pump is removed has to be covered properly so that impurities should not get mixed with the oil
* Overhaul & repair the removed pump as per the requirement. After repair is completed, fix back the pump as per point no G.
* Fix back the motor with the help of 32/5T crane using proper d-shackles & slings.
* After coupling the motor with the pump, tighten the base bolts of the motor (to fix it with the main plate of the pump on the tank)
* Clear the shutdown of the Lube. Oil pump and take trials of of the pump to check its free & smooth rotation, check correct direction and the discharge pressure developed by the pump
* After the total job is completed, inform the production control room, and do the necessary housekeeping

**Work No 6: Bearing replacement of blower**

**Take shutdown & production clearance before taking up this job.**

* Ask instrumentation to remove all their probes fitted to the bearing cover.
* Loosen the bolts of the bearing cover
* Remove the bearing cover with the help of dowel pins, and using the 32/5T blower house crane
* Take readings of bearings and clearances before dismantling
* Replace the bearings, check for any wear out of shaft. Check for proper clearance as per OEM recommendation.
* After replacement of the bearings, fix the bearing cover back with the help of 32/5T crane.
* Ask the instrumentation to fix back all the probes
* Clear the shut down and take trials
* Ensure proper housekeeping is done.
* Monitor blower vibration, current, flow, bearing temp and air leakages for one day if the blower is taken inline.

**Work No 07: Flushing of Heat-exchanger of Lube. Oil tank**

* Take shut down of Lube Oil pumps
* Close all the inlet & outlet valves of oil & water lines of heat exchanger. Remove the end cover bolts and the end cover
* Clean the tubes carefully with flexible tube
* Slightly open the inlet valve of water to flush the heat exchanger tubes
* After flushing is over close the inlet valve of water, and close the end cover by tightening all the bolts
* Normalize the system by clearing the shutdown of Lube. Oil pumps and opening all the inlet & outlet valves of oil & water lines of heat exchanger

**Work No 8: Filter cleaning of Lube. Oil tank**

* Take shut down of Lube. Oil pumps
* Open the valve of the drain line (just after the filters) going to tank
* Loosen the top cover bolts of the filter cover
* Remove the cover
* Keep a tray ready to collect the oil while removing the filter
* Remove the filter safely and keep it on clean place (cardboard sheet etc.)
* Dismantle the filter & clean the filter thoroughly with the help of diesel & air
* Assemble and fit it back in its place
* Fix the cover & tighten the bolts
* Carry out similar exercise for remaining filters (including return line filters)
* After cleaning of all the filters, normalize the system (by closing the valve of the oil line going to the tank), and clear the shutdown of the Lube. Oil pumps
* Start the pump and check the oil pressure after the filters, if normal

After the total job is completed, inform the production control room & blower operator, and do the necessary housekeeping

**Work No 9**  : **Rotor Assembly replacement**

* Take shut down of Blower motor, barring motor, lube system.
* Ask instrumentation to remove all their probes fitted to the bearing covers.
* Remove the bolts of the bearing cover & top casing.
* Remove top casing with the help of dowel pins, and using the 32/5T blower house crane.
* Remove the bearing cover with the help of dowel pins, and using the 32/5T blower house crane.
* Keep removed top casing with proper support
* Remove rotor assembly by using the 32/5T blower house crane.
* Keep removed rotor assembly on stand with proper support.
* Replace new rotor assembly by using the 32/5T blower house crane.
* Check clearances at near casing at all points of labyrinth seals. (It should be 0.5mm min.)
* Replace the bearings/ labyrinth seals if required, check for proper clearance as per OEM recommendation.
* After fixing of the bearings, fix the bearing cover back with the help of 32/5T crane.
* Check freeness of rotor, adjust if required.
* Fix of the top cover after cleaning joint surface & applying liquid sealant, with the help of 32/5T crane.
* Fix & tightened all casing bolts.
* Ask the instrumentation to fix back all the probes.
* Check coupling alignment, if required realign the couplings.
* Clear the shut down and take trials.
* Ensure proper housekeeping is done.
* Monitor blower vibration, current, flow, bearing temp and air leakages for one day if the blower is taken inline.

**Work No 10: Suction Air Filter Replacement**

* Inform the SS & blower operator about the activity.
* Take shut down of Blower motor & barring motor.
* Close the blower puffing airline valve & remove the hose.
* Remove the suction filter by removing filter locking bolt.
* Installed back new filter & tightened the locking bolt. (Ensure that O-ring is placed properly)
* Connect the air hose & opened the valve.
* Clear the shutdown & give clearance to blower operator.

**Work No 11: Emergency blower maintenance**.

1. Take shut down of emergency blower motor for working on emergency blower.
2. Ask instrumentation to remove all their probes fitted to the bearing covers.
3. Safely drain the oil with the help of oil pump & shift to the desired location.
4. Remove the bolts of the bearing cover & top casing.
5. Remove top casing with the help of dowel pins and using the 15T hydra.
6. Remove the trilobe & bearing, remove the left-over oil & clean the casing.
7. Install the new trilobe impeller & bearing.
8. Apply the gasket maker over the casing & install the top casing.
9. Fill the oil up to the max level mark (oil grade -OMALA S4WE 320)
10. Ensure proper housekeeping is done.
11. Clear the electrical shut down & take trials.

**Work No 12: Emergency blower valves & NRV replacement/Maintenance**

1. Take shut down of emergency blower motor for working on emergency blower equipment’s.
2. Furnace shut down is required for working on discharge valve
3. After taking shut down take work permit for working on blower valves.
4. After taking permit loosen the valve/NRV flange mounting bolts & remove the valve/NRV by properly slinging with the help of Hydra/TMC.
5. Install the new valve/NRV (Ensure the flow direction before installation) & tighten the flange bolts (Ensure flange gaskets are properly placed)
6. Ensure proper housekeeping is done.
7. Clear the electrical shutdown & work permit.

**Work No 13: Barring gear assembly replacement**

* Take clearance from operation department
* Take shut down of Blower motor, barring motor, lube system.
* Ask the E & I team to remove the limit switch.
* Drain the barring gear oil from bottom drain plug provided
* Remove the motor with 5T blower house crane by using proper certified lifting tools & keep at safe place.
* Sling the barring gear & remove the mounting bolts, once mounting bolts are removed lift the barring assembly & keep at designated place.
* Install the new assembly following the above steps
* Tightened the mounting bolts, fill the oil up to the level marked & installed the motor back.
* Ask the E & I team to fix back the limit switch.
* Clear the shutdown & take trial by running barring gear.
* Give clearance to operation dept.

**DO:**

* 32/5T crane to be operated only by the crane operator
* Whenever doing welding on blower, do direct earthing
* After finishing of all activities, shift the hoist / chain-block to the area marked parking place
* Ensure usage of oil tray while handling any oil to avoid any spillage
* Proper housekeeping to be done after the job is over
* Stay away from the blower during startup of blower.

**DONT’S** :

* Carry out any tightening or minor rectification jobs on running blower.

**REFERENCES: Operation & Maintenance manual.**

**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: 15.10.2021** | **Review Date: 15.10.2021** | **Review Date: 15.10.2021** |