**WORK INSTRUCTIONS OF MAINTENANCE OF AIR COMPRESSOR**

**SOP FOR**

**1.0 PURPOSE**

**Maintenance of Compressor in safe way for optimum performance**

**2.0 SCOPE**

**Blast furnace 3 Compressor**.

**3.0 RESPONSIBILITIES**

**Engineer In charge and workmen on job.**

**4.0 PROCESS DESCRIPTION**

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### PPE’s to be used:

* Helmet, Safety shoes, Cotton cloth, Ear plugs, Ear muffler and safety goggle (Depending upon the type of job), hand gloves

**LIST OF TASKS COVERED**

* Work No 1 : Air filter cleaning/replacement
* Work No 2 : Oil filter replacement
* Work No 3 : Back flushing of heat exchanger or its replacement
* Work No 4 : Air- oil Separator element replacement.
* Work No 5 : Pre/post water air separator element replacement
* Work No 6 : Air dryer valve/ Alumina replacement.

# 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

**Behavioral hazard**

1. Workmen under the influence of alcohol.
2. Violation of procedure.
3. Not wearing PPE’s.
4. Casual approach of operator.
5. Horseplay.

**Work No 1: Air filter cleaning/replacement**

1. Inform & obtain work clearance from Control room engineer & shift Superintendent.
2. Take shutdown of required compressor from Electrical Department (Isolation officer) by using (LOTO).
3. Once shutdown of the compressor is taken keep the equipment key and isolation key in the LOTO box and tag the LOTO box with the equipment ID and hand the LOTO box to the technicians (keep the shutdown paper in the box).
4. Ensure technicians working on the equipment puts their personal LOTO on the LOTO box. (as per One Man One LOTO procedure)
5. Take work permit from the Control room and hand over yellow copy to the technician working.
6. Remove the covers of compressor body.
7. Remove the clamp of air filter and replace it with a new/cleaned one. If the filter is to be cleaned & refitted, dry air from air header to be used.
8. Refit covers of compressor body.
9. Clear shutdown and hand over compressor for operation.

**Work No 2: Oil filter replacement & Lube oil replacement**

1. Inform & obtain work clearance from Control room engineer& shift Superintendent.
2. Take shutdown of required compressor from Electrical Department (Isolation officer) by using (LOTO).
3. Once shutdown of the compressor is taken keep the equipment key and isolation key in the LOTO box and tag the LOTO box with the equipment ID and hand the LOTO box to the technicians (keep the shutdown paper in the box).
4. Ensure technicians working on the equipment puts their personal LOTO on the LOTO box. (as per One Man One LOTO procedure).
5. Take work permit from the Control room and hand over yellow copy to the technician working.
6. Ensure that oil spillage kit is present at the work area.
7. Remove the covers of compressor body.
8. Close outlet valve of compressor.
9. Slightly loosen oil filling lid of oil separator to de- pressurize for 15 minutes.
10. Now check pressure (from pressure gauge on air-oil separator tank) and temperature of oil before proceeding further. Pressure will reduce to atmospheric pressure after isolating the compressor and temperature of oil will gradually come down to room temperature (30-450C). Check the temperature with help of ray tech gun.
11. Carefully remove the old filter with filter removing clamp.
12. Fill the new oil filter with oil, Apply oil on the O-ring of filter & fix in position& tighten with hand. Date of replacement may be written on new oil filter for future ready reference.
13. Drain the oil from old filter & dispose the filter.
14. Refit covers of compressor body.
15. Clear shutdown and hand over compressor for operation

**Replacement of lube oil**

1. Inform & obtain work clearance from Control room engineer& shift Superintendent 2.Take shutdown of required compressor from Electrical Department (Isolation officer) by using (LOTO).

3. Once shutdown of the compressor is taken keep the equipment key and isolation key in the LOTO box and tag the LOTO box with the equipment ID and hand the LOTO box to the technicians (keep the shutdown paper in the box).

4. Ensure technicians working on the equipment puts their personal LOTO on the LOTO box. (As per One Man One LOTO procedure)

5.Take work permit from the Control room and hand over yellow copy to the technician working.

6. Ensure that oil spillage kit is present at the work area.

7. Remove the covers of compressor body.

8. Close outlet valve of compressor. Slightly loosen oil filling lid of oil separator to de- pressurize for 15 minutes

9. Drain the oil carefully into a container from air-oil separator tank without spillage and inspect for any metallic particles.

10. Flush the oil tank with 5 liters of new SHELL CORONA S3 R68 oil& blow compressed air inside the tank. ( For Kaeser DSD240 compressor use Sigma fluid )

11. Plug the drain & Fill CORONA S3 R68 oil (approx.-45 liter for FHLG75 and 75 liters for 132 compressor Air) and ensure oil level in level indicator is between the 2 lines of level gauge ( For Kaeser DSD 240 compressor fill Sigma fluid 90 L and check the level on level indicator. Should indicate green color)

12. Fix covers of compressor body.

13. Clear shutdown and hand over compressor for operation.

**Work No 3: Back flushing of heat exchanger**

1. Inform & obtain work clearance from Control room engineer& shift Superintendent.
2. Take shutdown of required compressor from Electrical Department (Isolation officer) by using (LOTO).
3. Once shutdown of the compressor is taken keep the equipment key and isolation key in the LOTO box and tag the LOTO box with the equipment ID and hand the LOTO box to the technicians (keep the shutdown paper in the box).
4. Ensure technicians working on the equipment puts their personal LOTO on the LOTO box. (as per One Man One LOTO procedure).
5. Take work permit from the Control room and hand over yellow copy to the technician working.
6. Close inlet and outlet valve of water cooling line connected to heat exchanger.
7. Now make outlet as inlet & inlet as outlet by passing water through bypass line of inlet & outlet
8. Open inlet and outlet valve of heat exchanger & continue for 20-30 minutes.
9. For replacement, remove the old exchanger and fix back the new one.
10. Now restore the supply & return water line connections are normalize of heat exchanger and inlet and outlet valve of water line are open.
11. Clear shutdown and hand over compressor for operation
12. Hand over compressor for operation.

**Work No 4: Cleaning Air cooler (Radiator) and Oil cooler (for Kaeser DSD 240 Compressor)**

1. Inform & obtain work clearance from Control room engineer& shift Superintendent.
2. Take shutdown of required compressor from Electrical Department (Isolation officer) by using (LOTO).
3. Once shutdown of the compressor is taken keep the equipment key and isolation key in the LOTO box and tag the LOTO box with the equipment ID and hand the LOTO box to the technicians (keep the shutdown paper in the box).
4. Ensure technicians working on the equipment puts their personal LOTO on the LOTO box. (as per One Man One LOTO procedure)
5. Take work permit from the Control room and hand over yellow copy to the technician working.
6. Using compressed air clean the radiator to remove all the settled dust from fins.
7. Carefully clean fins of each tube. Compressed air hose to be kept at a distance of 2 inches from radiator tubes.
8. Steps 5 and 6 to be repeated for cleaning oil cooler.
9. Clear shutdown and hand over compressor for operation

**Work No 5**: **Air oil Separator element replacement.**

1. Inform & obtain work clearance from Control room engineer& shift Superintendent.
2. Take shutdown of required compressor from Electrical Department (Isolation officer) by using (LOTO).
3. Once shutdown of the compressor is taken keep the equipment key and isolation key in the LOTO box and tag the LOTO box with the equipment ID and hand the LOTO box to the technicians (keep the shutdown paper in the box).
4. Ensure technicians working on the equipment puts their personal LOTO on the LOTO box. (as per One Man One LOTO procedure)
5. Take work permit from the Control room and hand over yellow copy to the technician working.
6. Ensure that oil spillage kit is present at the work area.
7. Remove the top & side covers of compressor body.
8. Close outlet valve of compressor.
9. Slightly loosen oil filling lid of oil separator to de- pressurize for 15 minutes.
10. Now check pressure and temperature of oil before proceeding further. Pressure will reduce to atmospheric pressure after isolating the compressor and temperature of oil will gradually come down to room temperature (30-450C). Check the temperature with help of ray tech gun.
11. Slightly loosen the separator top flange fasteners, ensure the tank is fully de-pressurized
12. Open the drain plug & valve & drain the oil carefully without spillage.
13. Loosen minimum oil pressure (MOP) valve flanges.
14. Open the top flange of the oil separator carefully, and place it on cotton cloth.
15. Remove the oil separator element & inspect removed separator element.
16. Flush the oil tank with 5 liters of new **CORONA S3 R68 oil.** (for Kaeser DSD 240 compressor use sigma fluid instead of CORONA S3 R68 oil)
17. Drain oil from Oil separator element by loosening drain plug and also drain oil from air compressor unit
18. Drain the oil carefully without spillage and inspect for any metallic particles.
19. Close the drain valve & Plug the drain.
20. Insert the new oil separator element inside the separator casing.
21. Mount the separator top flange carefully and tighten the fasteners evenly.
22. Refit the MOP valve flanges.
23. Fill **CORONA S3 R68** oil **(approx.-45 ltr for FHLG-75 & 75 lits for FHLG-132)** and ensure oil level in level indicator. (For Kaeser compressor use Sigma fluid capacity approx. 90 L)
24. Refit covers of compressor body.
25. Clear shutdown and hand over compressor for operation.

**Work No 5**: **Pre/post water air separator element replacement of air dryer system**

1. Inform & obtain work clearance from Control room engineer& shift Superintendent.
2. Take shutdown of required dryer from Electrical Department (Isolation officer) by using(LOTO).
3. Once shutdown of the dryer is taken keep the equipment key and isolation key in the LOTO box and tag the LOTO box with the equipment ID and hand the LOTO box to the technicians (keep the shutdown paper in the box).
4. Ensure technicians working on the equipment puts their personal LOTO on the LOTO box. (as per One Man One LOTO procedure).
5. Take work permit from the Control room and hand over yellow copy to the technician working.
6. Isolate suction & discharge line of the separator element to be replaced and put mechanical isolation.
7. De-pressurize air dryer tank by opening FRL unit drain valve at the bottom.
8. Remove the old separator element & replace with the new one. Ensure O-ring/gasket at top portion must be sealed completely.
9. Open suction & discharge line of the separator element.
10. Clear electrical shutdown and hand over compressor for operation

**Work No 6**: **Valve/ Alumina replacement of air dryer system**

1. Inform & obtain work clearance from Control room engineer& shift Superintendent.
2. Take shutdown of required dryer from Electrical Department (Isolation officer) by using(LOTO).
3. Once shutdown of the dryer is taken keep the equipment key and isolation key in the LOTO box and tag the LOTO box with the equipment ID and hand the LOTO box to the technicians (keep the shutdown paper in the box).
4. Ensure technicians working on the equipment puts their personal LOTO on the LOTO box. (as per One Man One LOTO procedure)
5. Take work permit from the Control room and hand over yellow copy to the technician working.
6. Isolate suction & discharge line of the air dryer and isolate it using mechanical loto.
7. De-pressurize air dryer tank by opening FRL unit drain valve at the bottom.
8. Remove the old valve/ alumina & replace with the new one. Ensure o-ring/gasket at top portion must be sealed completely.
9. Open suction & discharge line of the separator element after removing mechanical isolation.
10. Clear electrical shutdown and hand over compressor for operation.

**DO:**

* Hoist to be operated only by the authorized &certified operators.
* After finishing of all activities, shift the hoist to the 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 compressor during startup of compressor.

DONT’S:

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

**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: 15.02.2023** | **Review Date: 15.02.2023** | **Review Date: 15.02.2023** |