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1. INTRODUCTION

Compressor plant consists of two low voltage compressors and three medium voltage compressors which in total add up to 156 cubic meters per minute of flow. The station usage averages to 96 cubic meters per minute at 720 kPa in total, which is shared between the service air and control air system. Standby diesel compressors supply control air systems in case of emergency or when the electrical control air compressors fail. Compressor plant and its accessories need to be maintained so that it is sustainable, reliable and responsive based on operational demands as per maintenance regime on figure 1.

2. SUPPORTING CLAUSES

2.1 SCOPE

This document covers the scope of work the compressor plant service maintenance for Hendrina Power Station.

2.1.1 Purpose

The purpose of this document is to provide the scope for compressor plant service maintenance for Hendrina Power Station.

2.1.2 Applicability

This document shall apply to Eskom Hendrina Power Station and other Business Unit.

2.2 NORMATIVE/INFORMATIVE REFERENCES

2.2.1 Normative

- [1] ISO 9001 Quality Management Systems.
- [2] Operating Regulations for High Voltage Systems (ORHVS).
- [3] 474-12636 Air Cleaning Generation Engineering Strategic Report 2023
- [4] 474-12638 Chemistry Generation Engineering Strategic Report 2023
- [4] 474-12641 Condensers, Feed heating and Cooling System Generation Engineering Strategic Report 2023
- [5] 474-12649 GCB Generation Engineering Strategic Report 2023
- [6] 474-12651 Control and Instrumentation Generation Engineering Strategic Report 2023
- [7] 474-12652 Civil Generation Engineering Strategic Report 2023
- [8] 474-12653 Bulk Materials Handling Generation Engineering Strategic Report 2023
- [9] 474-12659 Electrical Motors and Drives Generation Engineering Strategic Report 2023
- [10] 474-12662 Low Pressure Services Water Services Generation Engineering Strategic Report 2023
- [11] 474-12664 Fire Systems and Fire Management Generation Engineering Strategic Report 2023
- [12] 240-105929225 Compressed Air System Standard
- [13] 240-98790279 Online Leak Sealing: A Guideline for Power Plant Maintenance Personnel

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[14] SA Grid Code – Version 9 Network Code July 2014

240-101712128 Standard for the Internal Corrosion Protection of Water Systems, Chemical Tanks and Vessels and Associated Piping with Linings.

2.2.2 Informative

[1] Local operating procedures applicable to individual power stations.

2.3 ABBREVIATIONS

Abbreviation	Description
CAI	Compressed Air Indicator
CW	Cooling Water
CCW	Circulating Cooling Water
DC	Direct Current
DCP	Dust Conveying Plant
DCS	Distributed Control System
DHP	Dust Handling Plant
EPB	Emergency Push Button
Excl	Excluding
FAC	Forced Air Cooling
FAD	Free Air Delivery
FFP	Fabric Filter Plant
FGD	Flue Gas Desulphurisation
HMI	Human Machine Interface
LPS	Low Pressure Services
LOPP	Life of Plant Plan
OEM	Original Equipment Manufacturer
MUT	Multiple Unit Trip
PLC	Programmable Logic Controller
PSA	Pressure Swing Absorption
P&ID	Process and Instrumentation Diagram
RBI	Risk Based Inspections
SE	System Engineer
SSB	Shared Services Building
WTP	Water Treatment Plant

2.4 ROLES AND RESPONSIBILITIES

- Auxiliary Engineering – Compilation of the scope of work and list of service for this contract
- Materials Management – Managing of the service contract
- Spares Contractor – Executing the tasks as per the service contract

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2.5 PROCESS FOR MONITORING

N/A

2.6 RELATED/SUPPORTING DOCUMENTS

N/A

3. SCOPE OF WORK

The service and maintenance schedule are listed below.

Scope for services A: Compressor

- Check cooling, clean cooler.
- Check valves for wear, clean, change wear parts.
- Check coupling.
- Replace air inlet filter.
- Replace filter mats.
- Check oil level, oil filter, oil separator cartridge and oil scavenge tube.
- Change oil and filter if necessary.
- Check performance of compressor air end, vibration, direction of rotation, leaks.
- Check pipes work and hose connections for leaks and tightness.
- Check pressure relief valve and gauges on air receiver
- Check and clean condensate drain of ZK centrifugal separator.
- Check electrical cables and cable inlets, check terminal strip connections for tightness.
- Clean electrical cabinet.
- Check performance of drive motor, check motor fan blades for damage.
- Grease Drive motor grease nipples.
- Check and if necessary, adjust regulating, switching and control elements.
- Check shutdown and safety functions.
- Check indication, warning and alarm functions.
- Check safety valve and fittings.
- Service Eco drains.
- Plant leaks detection must be executed
- PRV's shall be tested as per statutory PM's
- Provisional maintenance of the extra two dryers
- Make sure always the pressure regulating valve is in a serviceable condition.
- Flow meters must be checked that are always functional and available.
- Submit a proposal methodology of major service prior for 6 months, before contract expires.
- Maintain mobile portable compressors
- Contract price adjustment shall be performed.

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Scope for services B: Compressor

- Check cooling, clean cooler.
- Check valves for wear, clean, change wear parts.
- Check coupling.
- Replace air inlet filter.
- Replace filter mats.
- Check oil level, oil separator cartridge and oil scavenge tube.
- Replace oil filter.
- Replace oil separator Filter
- Change compressor only if necessary (based on oil analysis).
- Check performance of compressor air end, vibration, direction of rotation, leaks.
- Check pipes work and hose connections for leaks and tightness.
- Check pressure relief valve and gauges on air receiver.
- Check and clean condensate drain of ZK centrifugal separator.
- Check electrical cables and cable inlets, check terminal strip connections for tightness.
- Clean electrical cabinet.
- Check performance of drive motor, check motor fan blades for damages.
- Grease Drive motor grease nipples.
- Check and if necessary, adjust regulating, switching and control elements.
- Check shut down and safety functions.
- Check indication, warning and alarm functions.
- Check safety valve and fittings.
- Service Eco drains.

Scope for service C: Compressor

- Check cooling, clean cooler.
- Check valves for wear, clean, change wear parts.
- Check coupling, replace if necessary.
- Replace air inlet filter.
- Replace filter mats.
- Check oil level, oil filter, oil separator cartridge and oil scavenge tube.
- Replace oil filter.
- Replace oil separator filter.
- Change compressor oil if necessary. (based on oil analysis).
- Maintenance kit, minimum pressure check valve.
- Maintenance kit, inlet valve.

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- Maintenance kit, combination valve.
- Maintenance kit, vent control valve.
- Maintenance kit, venting valve.
- Maintenance kit, pneumatic valve.
- Replace fan motor bearings.
- Check performance of compressors air end, vibration, direction of rotation, leaks.
- Check pipes work and hose connection for leaks and tightness.
- Check pressure relief valve and gauges on air receiver.
- Check and clean condensate drain of ZK centrifugal separator.
- Check electrical cables and cable inlets, check terminal strip connection for tightness.
- Clean electrical cabinet.
- Check performance of drive motor, check motor fan blades for damages.
- Grease Drive motor grease nipples.
- Check and if necessary, adjust regulating, switching and control elements.
- Check shut down and safety functions.
- Check indication, warning and alarm functions.
- Check safety valve and fittings.
- Service eco drains.

Scope for services D: Compressor

- Check cooling, clean cooler.
- Check valves for wear, clean, change wear parts
- Replace drive coupling
- Replace air inlet filter
- Replace filter mats
- Check oil level, oil filter, oil separator cartridge and oil scavenge tube
- Replace oil filter
- Replace oil separator filter
- Replace compressor oil
- Overhaul minimum pressure check valve overhaul inlet valve
- Overhaul combination valve
- Overhaul vent control valve
- Overhaul venting valve
- Overhaul pneumatic valve
- Replace fan motor bearings
- replace main drive motor bearings

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- replace control line hoses
- check performance of compressor air end, vibration, direction of rotation, leaks
- check pipes work and hose connections for leaks and tightness
- check pressure relief valve and gauges on air receiver
- check and clean condensate drain of ZK centrifugal separator
- check electrical cables and cable inlets, check terminal strip connections for tightness
- clean electrical cabinet
- check performance on drive motor, check motor fan blades for damage
- grease drive motor grease nipples
- check and if necessary, adjust regulating, switching and control elements
- check shut down and safety functions
- check indication, warning and alarm functions
- check safety valve and fittings
- service Eco Drains

Scope of maintenance work: Dryers

The service and maintenance schedule are listed below.

Scope for service A: Dryers

- Check, clean heat exchanger
- Check valves for wear, clean
- Check air inlet temperature, air outlet temperature, dew point temperature
- Check for wear, clean condensate drains, change wear parts
- Check refrigeration system, clean refrigerant condenser
- Replace internal micro filters and external FE micro filters
- Check and if necessary, adjust regulating, switching and control elements
- Check shut-down and safety functions
- Check filtrate and oil drainage for free flow, clean

Scope for services B: Dryers

- Check, clean heat exchanger
- Check valves for wear, clean
- Check air inlet temperature, air outlet temperature, dew points temperature
- Check for wear, clean condensate drains, replace wear parts
- Check refrigeration system, clean refrigerant condenser
- Replace internal micro filters and external FE Micro filters
- Check and if necessary, adjust regulating, switching and control elements
- Check shut down and safety functions

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- Check indication, warning and alarm function
- Check filtrate and oil drainage for free flow, clean

Scope for services C: Dryers

- Check, clean heat exchanger.
- Check valves for wear, clean.
- Check air inlet temperature, air outlet temperature, dew point temperature.
- Check for wear, clean condensate drains and replace wear parts.
- Check refrigeration system, clean refrigerant condenser.
- Replace internal Micro Filters and external FE micro filter.
- Replace all sealing rings on filter parts.
- Check refrigerant circuit, top up if necessary.
- Check and if necessary, adjust regulating, switching and control elements.
- Check shut down and safety functions.
- Check indication, warning and alarm function.
- Check filtrate and oil drainage for free flow, clean.

Scope for service D: Dryers

- Check, clean heat exchanger.
- Check valves for wear, clean.
- Check air inlet temperature, air outlet temperature, dew point temperature.
- Check for wear, clean condensate drains and replace wear parts.
- Check refrigeration system, clean refrigerant condenser.
- Replace internal Micro Filters and external FE 177 micro filter.
- Replace all sealing rings on filter parts.
- Check refrigerant circuit, top up if necessary.
- Replace inline refrigerant filter.
- Replace refrigerant compressor motor oil.
- Check and if necessary, adjust regulating, switching and control elements.
- Check shut down and safety functions.
- Check indication, warning and alarm function.
- Check filtrate and oil drainage for free flow, clean.

Electrical Scope

The Contractor does the following:

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Task	Frequency	Details of task
Inspection/Cleaning	Annually	<ul style="list-style-type: none"> ❖ Ensure that the wiring, trunking, and din rails are properly secured. ❖ Conduct visual inspections on the panel, ensuring that all internal components are secured, with no physical damage. ❖ Ensures that the signs are mounted where the <i>Employer</i> deems it necessary. ❖ Ensures that the circuit wiring is neat and labelled. ❖ Inspect the wiring by conducting tightness checks on all points of termination. Ensure that there are no loose connections on any part of the circuit. ❖ Visual inspection on motor – check condition of the cooling fan, ensure that all rotary parts are secured with guard, earthing is secured, that there are no hot spots on termination in the terminal box, ensures that the star point of the motor is secured in place, mounting bolts are secured, and ensures that the motor has soft foot. ❖ Ensures that all latching mechanisms i.e., contactors, relays, timers, and other auxiliaries are properly making and realising. ❖ Ensures that all protection components are set correctly for duty (contact the <i>Employer</i> for the settings document). ❖ Ensures that no protection settings are changed in the plant without following the engineering change management (ECM). ❖ Ensures that all the push buttons are fully functional and are not sticky. ❖ Ensures that indication equipment(s) are functional.
Motor overhauling	5 yearly	<ul style="list-style-type: none"> ❖ <i>Contractor</i> removes the motor from the plant for overhauling and replaces it with a healthy spare motor from the stores.
Fault finding	As required	<ul style="list-style-type: none"> ❖ Attends to all plant breakdowns and fix all defects reported and found during fault finding. ❖ All defects to be recorded and submitted to the employer via email every Monday. ❖ In the event where the motor is faulty the <i>Contractor</i> is responsible for the removal/installation/uncoupling and coupling of the motor to the load/disconnecting and reconnecting of cables/commissioning. If the motor is to be

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		<p>sent away for repairs the <i>Employer</i> assumes the responsibility.</p> <ul style="list-style-type: none"> ❖ Ensures that components are changed with the same type of component, if the replacement component is obsolete, the ECM route shall be followed, and the <i>Employer</i> will be promptly informed. The <i>Employer</i> is responsible for the ECM. ❖ Ensures that faulty power cables are reported to the <i>Employer</i> (<i>Employer</i> assumes the responsibility of fixing the cables). ❖ Performs other test advised by the equipment manufacturer. ❖ Conducts electrical tests on motor; insulation resistance test (IR), polarity index test (PI) and, winding resistance.
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C&I Scope

No	COMPONENT	ACTIVITY TYPE (INSPECTION / TEST / REFURBISH / REPLACE)	FREQUENCY	RESPONSIBILITY
1.	Differential Pressure Gauges	Check for differential pressure.	Monthly	IMD
		Replace	As and when required	Service Provider
2.	Pressure Switches.	Calibrate	As and when required.	Service Provider
		Replace	As and when required.	Service Provider
3.	ITABAR Flow Sensor	Clean for dirt build up.	As and when required.	IMD
		Replace	As and when required.	Service Provider
4.	Pressure Transmitter Type P62	Check for zero.	As and when required.	IMD
		Factory Calibration	As and when required.	Service Provider
		Replace	As and when required.	Service Provider
5.	Resistance Thermometer PT100	Clean with nonaggressive and nonabrasive liquid and softly cloud.	As and when required.	IMD
		Replace	As and when required.	Service Provider
6.	DP Sitrans P DS III	Check for calibration and calibrate if out of tolerance.	Yearly	IMD
		Replace	As and when required	IMD
7.	Dewpoint Sensor	Calibration	Yearly	Service Provider
		Check dewpoint temperature	Daily	IMD/Ops
		Replace	As and when required.	Service Provider
8.	CPU, Simatic S7-200	Fault analysis and repair faults.	As and when required.	Service Provider
		Replace	As and when required.	IMD
9.	Sigma Simatic Air Manager 4.0 Controller	Replace the buffer-battery.	As and when required.	IMD
		Fault analysis and repair faults.	As and when required.	Service Provider
		Replace	As and when required.	Service Provider
10.	Sigma Control 2	Fault analysis and repair faults.	As and when required.	Service Provider
		Replace	As and when required.	Service Provider
11.	Pneumatic Control Valve	Set up and stroking.	As and when required.	Service Provider.
		Replace	As and when required.	Service Provider
		Replace	Yearly	Service Provide
12.	Eco Control	Fault analysis and fault repairs.	As and when required.	Service Provider
		Replace	As and when required.	Service Provider
13.	Moisture Indicator	Visual Check	Weekly	IMD
		Replace	Yearly	Service Provider

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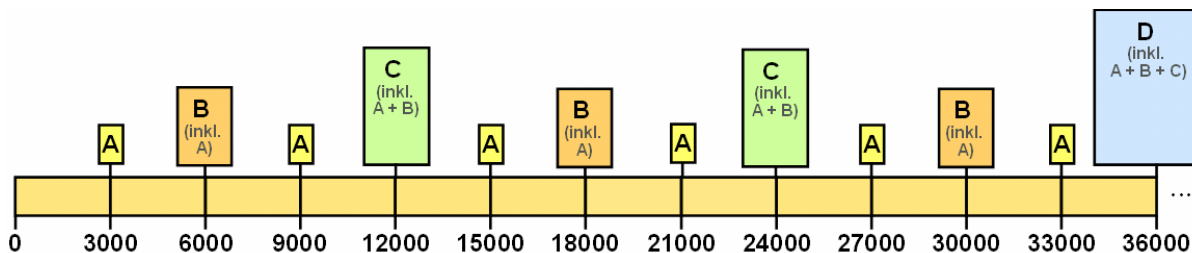


Figure 1: Maintenance Regime (in running hours)

4. AUTHORISATION

This document has been seen and accepted by:

5. REVISIONS

6. DEVELOPMENT TEAM

The following people were involved in the development of this document:

7. ACKNOWLEDGEMENTS

N/A

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