 Eskom	Scope of Work	Medupi Power Station
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1. INTRODUCTION

This document outlines the requirements and expectations for the refurbishment of the Vertical Spindle Mill (MPS 265) gearbox units at Medupi Power Station. The primary objective of this refurbishment project is to restore the gearboxes to optimal operational condition, thereby enhancing the reliability and efficiency of the milling plant. This initiative is a critical component of Medupi Power Station's broader strategy to improve overall station performance, reduce downtime, and ensure sustained energy output in line with national energy demands.

2. SUPPORTING CLAUSES

2.1 SCOPE

The scope will cover the refurbishment of Milling Plant Main Gearboxes as and when required, for a contract period of five (5) years.

2.1.1 Purpose

The primary purpose of this project is to contribute directly to Medupi Power Station's performance improvement targets, specifically achieving a station performance of 92% Energy Availability Factor (EAF), 6% Planned Capability Loss Factor (PCLF), and 2% Unplanned Capability Loss Factor (UCLF). All refurbishment activities must be executed in alignment with these performance objectives. The service providers are expected to deliver high-quality workmanship, adhere to strict timelines, and ensure that the refurbished gearboxes meet or exceed original equipment manufacturer (OEM) standards to support the station's operational reliability and availability.

2.1.2 Applicability

This document shall apply throughout Eskom Medupi PowerStation and to the Eskom partners that are contractually mandated to support the objectives of the outlined scope of work.

2.2 NORMATIVE/INFORMATIVE REFERENCES

Parties using this document shall apply the most recent edition of the documents listed in the following paragraphs.

2.2.1 Normative

- [1] ISO 9001 Quality Management Systems.
- [2] 240-56064555: Extreme Pressure Gear Oils Standard
- [3] 200-39523 Medupi Power Station Technical Documentation Pulverised Plant Gear Unit
- [4] 240-83797901 Technical Requirements for Managing Lubricants Standard

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- [5] 474-12862 Tribology Generation Engineering Strategic Report
- [6] 241-2022339 Medupi Power Station Quality Control and Verification
- [7] 240-56063919 Mill Reducer Gearbox Maintenance Guideline
- [8] 240-83539994 Standard for Non-Destructive Testing (NDT) on Eskom Plant

2.2.2 Informative

- [9] DIN 51818 Consistency classification of Lubricating Greases
- [10] DIN 51801 Determination of dropping point of lubricating grease

2.3 DEFINITIONS

Definition	Description
Contractor	Service provider contracted for supplying specific service to Eskom, Medupi Power Station.
Employer	Eskom, or Eskom Medupi Power Station

2.3.1 Disclosure Classification

Controlled disclosure: controlled disclosure to external parties (either enforced by law, or discretionary).

2.4 ABBREVIATIONS

Abbreviation	Description
AGMA	American Gear Manufacturers Association
BOM	Bill of Material
ISO	International Standards Organization
KKS	Kraftwerk Kennzeichen System
MPI	Magnetic Particle Inspection
MPS	Mill Pendulum Bowl (translated from Germany to English)
NEC	New Engineering Contract
OEM	Original Equipment Manufacturer
PCLF	Planned Capability Loss Factor
QCP	Quality Control Plan
SOW	Scope of Work
TET	Technical Evaluation Team
UCF	Unit Capability Factor
UCLF	Unplanned Capability Loss Factor

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2.5 ROLES AND RESPONSIBILITIES

Activity	Responsible	Accountable	Consult	Inform
Compilation	<ul style="list-style-type: none">• System Engineer	<ul style="list-style-type: none">• Boiler Engineering Manager	<ul style="list-style-type: none">• Boiler Engineering Manager	<ul style="list-style-type: none">• All
Revision and Template update	<ul style="list-style-type: none">• System Engineer	<ul style="list-style-type: none">• Boiler Engineering Manager	<ul style="list-style-type: none">• Maintenance Manager• Documentation Officer	<ul style="list-style-type: none">• All
Implementation	<ul style="list-style-type: none">• Contractor• Technician• Senior Technician• Mechanical Maintenance Manager• MM Refurbishment Officer	<ul style="list-style-type: none">• Contractor• Technician• Senior Technician• Mech. Maintenance Manager• MM Manager	<ul style="list-style-type: none">• Maintenance Manager• System Engineer	<ul style="list-style-type: none">• All

2.6 PROCESS FOR MONITORING

In case of any additions, subtractions and/or amendments to the contents of the scope of work or any part of this document prior the revision date, the Boiler Engineering Manager shall appoint personnel to effect the necessary changes and to use the most current approved template for the new revision.

2.7 RELATED/SUPPORTING DOCUMENTS

N/A

3. TECHNICAL SPECIFICATION

3.1 TECHNICAL REQUIREMENTS

3.1.1 Details of Plant

The refurbishment work is to be carried out on the mill gearbox with the following details to be considered:

Equipment Layout:

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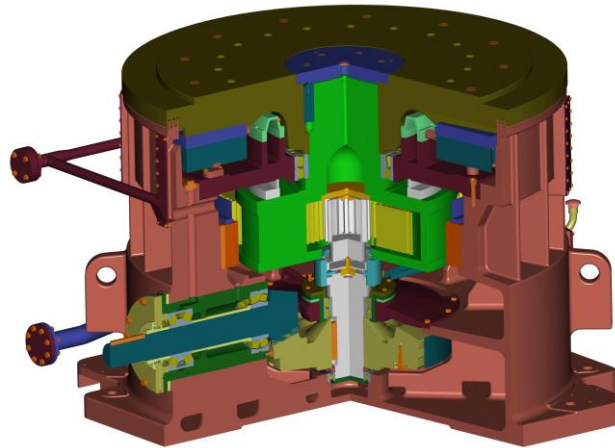


Figure 1: KPV 1750 S Bevel Planetary Gear Unit

- The gear unit is a two-stage bevel planetary gear unit with a bevel stage and a planetary stage.
- The drive shaft is positioned horizontally and the ring gear, planetary gearset and output flange operate in vertical axes.
- The ring gear and planetary stage are connected by a toothed coupling.
- An axial tilting pad plain bearing is mounted at the top of the casing to absorb the axial static and dynamic forces from the pulverizer.

Table 1: Technical Operating Parameters

Type	KPV-gear unit
Weight	31900 (kg)
Dimensions (L x B x H) approx	3,02 x 2,66 x 1,91 (m)
Oil volume	1310 (L)
Gear unit effective output	920 (kW)
Input speed	990 (rpm)
Output speed	24.49 (rpm)
Gear ratio	34.75 (i)
Operating Lube Oil	Gen Gear XEP 460
Testing Lube Oil	SAE 30 Engine Oil
Oil Temperature (inlet)	55 (deg. Celsius)
Oil Temperature (outlet)	45 (deg. Celsius)

The refurbishment scope shall include at least the following activities:

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3.1.1.1 Pre-work Activities

- The Supplier shall arrange for collection of the damage gearbox from Medupi stores, and the contact department will be Materials Management.
- Record history of the gearbox (i.e. current nameplate details, condition monitoring information, running hours to date, plant location where it was operating and previous refurbishment work information where applicable). Request the Employer to provide the historical information.
- Note the direction of rotation of both the input and output shafts.
- Inspect and record of external condition (i.e., covers, flanges, breathers etc.).
- Inspect the gearbox and its lubrication system prior to opening for signs of leaks and damage that may require repair or replacement. Take note of the types and makes of pumps, motors, filters, pressure gauges, switches, oil type and anything else that is recommended by the client for testing purposes and prepare them on time.

3.1.1.2 Disassembly

- Record conditions after removing the top cover (with all components) assembled. Inspect for traces of moisture, contamination etc.
- Disassembly in stages and record all findings at each stage of components removal.
- The inspections must include photographs and must be conducted with an intention to identify the cause of the failure.
- Isolate components for detailed assessment and label them accordingly.
- Prepare inspection report and share it with Eskom for review and acceptance, prior to any repair works. The inspection report to include failure assessment and associated recommendations to prevent reoccurrence.

3.1.1.3 Detailed Assessment

a) Gears

- Inspect and record any visual signs of damage wear or profile change on gear flanks.
- Perform a 100% MPI of all gear teeth, all indications must be recorded.
- Gear shaft assemblies on worn or damaged gears, should be placed in a press and disassembled. The shaft and bore of the gear should be checked for signs of fretting and corrosion.
- For dismantled gear/shaft assemblies, MPI all keyways and measure and record the dimensions of all keys and keyways.

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- Measure and record the dimensions of the gear boxes and the shaft diameters to check and confirm fits and tolerances.
- If new gears are required and no drawing exists, record face-width, number of teeth, gear types and heat treatment method (through hardened, nitride, carburized, induction or flame hardened).

b) Bearings

- All bearings shall be replaced, except where Eskom grants an exemption. Such exemptions may be considered if a bearing has completed less than 50% of its L₁₀ design running hours and the condition is deemed 'satisfactory' by the original bearing manufacturer's technical department or a suitably qualified professional.
- Visually inspect and record the condition of the rolling elements and raceways for signs of wear and damage.
- Check the outer races for signs of movement in the bearing bores of the case and for signs of fretting and corrosion.
- Check the wear patterns of the bearing races for indications of misalignment.

c) Shafts

- MPI the shaft with attention to keyways, fillet radii and changes in section of the shaft.
- Check all bearing seats for signs of wear.
- Measure the bearing seats to check fits and tolerances and compare with the selected or specified bearing.
- Check oil seal tracks for signs of damage or wear.

d) Casing and lubrication

- Inspect case joints for presence of paper-like gasket materials.
- Check for condition of all machined faces for damage.
- Check alignment of joint faces with gearbox feet and mounting faces.
- MPI all bearing bores and case feet.
- Dye penetrant test the entire case after cleaning.
- Where welding took place, MPI all welds.

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- Measure all bearing bore diameters and distances of each bore and compare with the drawing requirements.
- Check condition of internal lubrication pipework removed from the gearbox.
- Check oil ways and supply ports cast into casing for signs of blockages and sludge build up.
- Record the details of all fastenings (nuts and bolts), dowels, washers, locking screws, seals and gaskets.
- Re-assemble case (with gasket if required) and tighten all bolts to the manufacturers specified torque.
- Visually inspect all covers, oil catchers, loose bearing housings etc.

3.1.1.4 Replace or Repair Components

The specific scope of replacement or repair shall be finalized upon Eskom's review and acceptance of the damage inspection report, along with the requisite quality control pre-work documentation (e.g., MPI certificates).

3.1.2 Manufacturing Requirements

The manufacturing of gearbox parts must be approved by Eskom, and the applicable standards and design codes utilised for manufacturing must be recorded and included in the databook. As part of manufacturing related documentation, at least the following must be submitted to Eskom for review:

- Certificates of analysis for all raw materials (e.g., steel for gears, bearings, housing castings).
- Evidence of material testing to confirm mechanical properties and chemical composition.
- Material certificates for all the new components must be made available.
- Manufacturing Process Plans (MPPs) or Routings: Documents outlining the sequence of manufacturing operations, machine settings, tooling requirements, and in-process inspection points for each component.
- Documentation of heat treatment parameters (temperature cycles, soaking times, quenching media) and results (hardness, microstructure) for all manufactured gears.
- Detailed reports from gear measuring machines, verifying gear tooth profile, lead, pitch, runout, and accuracy grades and reference the relevant standard (e.g., as per AGMA or ISO standards)
- Reports from NDT methods i.e., magnetic particle inspection, dye penetrant inspection, or ultrasonic testing for detecting surface or internal flaws in critical components.

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3.1.3 Testing Requirements

- a) Upon completion of assembling, the gearbox shall be prepared for testing. Eskom shall witness the testing process. The test shall include visual inspection of:
- Oil leaks checks,
 - Noise level measurements,
 - Vibration analysis,
 - Inlet and outlet temperature monitoring,
 - Filter pressure drop,
 - Motor power and speed,
 - Common line oil flow rate and
 - Specific lubrication points flowrates as per guideline (to be provided by Eskom)
- b) The test procedure and test check sheet shall be compiled by the service provider, reviewed, and signed by Eskom prior to any testing work.
- c) Vibration levels shall be checked under “no-load” conditions and the results recorded for Eskom. Where a load test is accommodated, it will be a preferred option.
- d) The service provider shall be able to accommodate potential additional requests of lubrication oil analysis and provision of test reports.

3.1.4 Surface and Corrosion protection

The supplier shall submit details of corrosion protection measures to protect the gears and casing from deterioration during storage. If a gearbox is to be stored dry for a long period, the use of vapour phase inhibitors (VPI's) or vapour corrosion inhibitors (VCI's) is recommended. If the gearbox is to be stored for a period exceeding 12 months, or if there is a risk of inherent moisture or significant fluctuations in ambient humidity, it is recommended that desiccant bags be placed inside the unit to mitigate moisture-related risks.

The supplier must submit details of the proposed coating and preservation method along with material data sheets to Eskom's corrosion specialists for approval.

3.1.5 Information required on bearings

- Bearing numbers, bearing clearance and brand name for all replaced bearings. This information must be documented and submitted to Eskom.

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- Any specific tests performed must be documented and included in the final databook.

3.1.6 Transportation

Gearboxes should be transported in such a manner as to prevent damage to the bearings or other gearbox components and to prevent the ingress of dirt or moisture during transportation. It is preferable that suitable vibration monitoring equipment ("G sensor") be installed for transportation and handling purposes to record any unsuitable handling conditions of the gearbox that can lead to secondary damage or warranty claims.

3.1.7 Handover Requirements

- A fully signed databook for each gearbox refurbished must be handed over to Eskom for record keeping. Hardcopies as well as electronic copies of the gearbox manufacturing Data Book shall be supplied to the Employer with or before the delivery of the refurbished gearbox. This Data Book will be used during on site Quality Control checks to do final Quality acceptance of gearbox delivered. Refurbished gearboxes delivered without this documentation will be rejected.
- Any damaged spare parts which were replaced with 'new', must be returned to Eskom unless otherwise stated by the Eskom's Materials Management department.
- Operation and Maintenance Manuals: Under specific circumstances the client may request Comprehensive guides for proper installation, operation, lubrication, troubleshooting, and maintenance schedules. The service provider should be able to support on such requests.
- Spare Parts List: A detailed list of recommended spare parts with part numbers.
- All gearboxes shall carry a 24-month warrantee from date of delivery to Eskom Stores (prior installation to the plant), and this warranty shall be overwritten by a 12 month warranty from the day of operating in the plant). Documentation outlining the manufacturer's warranty terms shall be provided as handover of the refurbished items.
- Traceability Records: Documentation that allows for the tracing of all components back to their origin and associated manufacturing and inspection records.

3.2 GENERAL REQUIREMENTS

3.2.1 Quality requirements

The service provider shall operate a Quality Management System (QMS) that is compliant with ISO 9001 standards and aligned with the Medupi Power Station Quality Control and Verification Procedure (Document No. 241-2022339).

The following shall constitute Eskom's quality requirements:

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- The Eskom Engineer and Quality Control personnel shall review the Quality Control Plan (QCP), identify, and mark all intervention points, and formally approve the QCP. This approval shall occur only after the damage report has been accepted and prior to the commencement of any repair activities.
- All quality references and standards cited within this document shall be strictly adhered to throughout the execution of the work.

3.2.2 Communication requirements

- All queries or improvement proposals that may influence the project scope, associated costs, availability of spare parts, potential time delays, or any aspect of the contractual terms shall be formally communicated through the designated Contract Manager appointed by Eskom.
- In instances where execution of any part of the scope is impractical despite all reasonable efforts, or where there is a foreseeable risk of deviation from established standards, a formal concession request must be submitted for review and approval.
- For any QC interventions requiring Eskom personnel to attend the service provider's repair workshop, the service provider shall issue a formal invitation no less than five (5) working days in advance. This notice period is to ensure adequate preparation by the designated Eskom inspectors. Where the inspector deems necessary to waive the inspection request, such waiver shall be made in writing.
- All collections will be made from Eskom Medupi Main Stores, this is the same location to be used as a delivery point after refurbishment.

3.2.3 Execution Program and Quoting Requirements

- The supplier shall provide a time-based production schedule to Eskom prior to starting work.
- A quote as well as full assessment report (failure report) shall be submitted to the Employer (attention of Contract Manager and System Engineers) within 10 working days after the issuing of task order for "strip-and-quote".
- The quote shall contain a detailed cost breakdown of all spares and services required, including a breakdown of the lead time per item as well as total repair work.
- Only after the quote, assessment report and QCP has been accepted by the Employer, will a task order be issued to proceed with repairs.

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4. AUTHORISATION

This document has been seen and accepted by:

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5. REVISIONS

Date	Rev.	Compiler	Remarks
June 2025	0	S Kuzwayo	First Issue - Draft
June 2025	1	S Kuzwayo	First Issue – Reviewed and Signed

6. DEVELOPMENT TEAM

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

- Siya Kuzwayo
- Phuti Mashita
- Kenneth Ndumo
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