Eskom	Instructions	Hendrina Power Station

Title: **Scope of Work for the Supply and Delivery of Antiscalant Chemical for Cooling Water System and Ash Water System as and when Required for 5 Years at Hendrina Power Station.**

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1. Introduction

Chemicals are used at Hendrina Power Station for a wide range of reasons including but not limited to treating of water throughout the energy generation process. The availability of such chemicals is of significant importance in energy generation.

2. Supporting Clauses

2.1 Scope

This document describes the technical requirements for the supply and delivery of antiscalant chemical for cooling water system and ash water system as and when required for 5 years at Hendrina Power Station.

Purpose

The purpose of the document is to provide guidance and specify the requirement for the sourcing of the chemicals for Hendrina Power Station.

2.1.1 Applicability

This document is applicable to Hendrina Power Station.

2.2 Normative and Informative References

2.2.1 Normative

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

2.2.2 Informative

[1] 240-150642762, Generation Plant Safety Regulations

[2] ISO 9001 Quality Management Systems.

[3] Handling of hazardous substances

[4] Occupational Health & Safety Act

2.3 Definitions

Definition	Description
System	An integrated set of constituent pieces that are combined in an operational or support environment to accomplish a defined objective. These pieces include people, hardware, software, firmware, information, procedures, facilities, services and other support facets

2.3.1 Classification

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

2.4 Abbreviations

Abbreviation	Description
HPS	Hendrina Power Station
QCP/QIP	Quality Control Plan / Quality Inspection Plan
PS	Power Station
SOW	Scope of Work
ISO	International Standards Organisation
QCP	Quality Control Plan
OHSA	Occupational Health and Safety Act
BMH	Bulk Materials Handling
L	Litres
Kg	Kilograms
WTP	Water Treatment Plant

2.5 Roles and Responsibilities

System Engineer – Responsible for defining the technical specifications and scope to be executed by the contractor, as well as ensuring that sound engineering practice is followed, and quality work is delivered.

Contract Manager – Responsible for the procurement document(s) required to establish a contract with the contractor deemed capable of executing the scope.

Contractor – Responsible for providing all the services required for the execution of the full scope of work.

2.6 Process for Monitoring

N/A

2.7 Related/Supporting Documents

None

3. Scope of Work

The scope for this work coverers the following:

- Supply and delivery of aniscalant chemical for cooling and ash water system. The chemical specifications are as specified on the following section (chemical specification).
- Provision of technical support to adjust chemical dosing (when necessary) and monitoring of chemical performance once every month. This shall include the following:
    - Performance criteria/program to control deposit thickness monitoring program. (e.gscale coupons, corrosion coupons etc.)

- Conduct a base line study within the first week of contract award inspecting relevant dosing system points for current and existing condition.

4. Chemical specifications

The table below is the list of the chemicals to be supplied and their specifications as well as the estimated quantities for the duration of the contract.

Material No.	Short Description	Long Description	Quantity
0209531	**5.1.2.3 CHEMICAL: ASHLINE** ANTISCALNT; LIQD	CHEMICAL: TYPE: ASHLINE ANTISCALANT: FORM; LIQUID; CONTAINER; TANK BULK; FOR USE ON ASH WATER SYSTEM	900 000L
0183055	CHEMICAL: CW and AUXILIARY ANTISCALANT LIQD; TANK BULK	CHEMICAL: TYPE: ANTISCALANT: FORM; LIQUID; CONTAINER; TANK BULK; FOR USE ON COOLING WATER AND AUXILLIARY COOLING WATER SYSTEM	550 000L

4.2 Effective Date

This document will be effective from the date that the contract is authorised.

5. Requirements

5.1 Handling and Transportation

The *contractor* is expected to practice safe handling techniques during the onloading, offloading, and throughout the transportation of the chemicals, if necessary. The *Employer's* representative will not accept any damaged items upon delivery.

Should the delivered chemicals be found to be defective or out of spec, the contractor remains responsible for the handling and transportation in the replacement process of the item(s).

5.2 Chemical treatment program selection requirement to consider.

The *Contractor* takes into consideration the cooling water quality and makes provision in his/her selection of chemicals for any species that may cause interference in the action of the proposed chemical treatment programme and remains responsible for the performance to the specifications specified in this document.

The treatment chemicals offered must be proven to be effective to improve and keep the system stable and the conditions complying with the relevant Eskom Standard limit values.

The treatment chemicals must be adaptable to system changes e.g., variation in water quality and temperature and seasonal (winter/summer)

The cooling water chemistry must be compliant with the Eskom Standard with the limits as indicated in the table below:

Parameter	**Limit or Range**
Turbidity	< 100 NTU
Clarifier turbidity	<15 NTU
Conductivity	< 4000 uS/cm
pH	8.1 - 8.6 at 25 º C
P Alkalinity	< 7.5 mg/kg as CaCO3
M Alkalinity	80 - 120 mg/kg as CaCO3 without a crystal modifier **120 to 160 mg/kg as CaCO3 with a crystal modifier**
Calcium	200 - 500 mg/kg as CaCO3
Magnesium	Mg (as CaCO3) x SiO2 <25 000
Silica	<150 mg/kg as SiO2
Permanent hardness only when Tot hard > M Alk	< 400 mg/kg as CaCO3

Calcium carbonate precipitation potential at 38degC	> 10 but < 30 mg/kg as CaCO3
Sulphate (note Na limit)	< 1000 mg/kg if Na+ < 250mg/kg
Sulphate (note Na limit)	< 750 mg/kg if Na+ > 250mg/kg
Phosphate	< 0.5 mg/kg as PO4
OA and COD or TOC	As low as economically possible through application of suitable flocculants
Chloride	< 400 mg/kg as Cl
Nitrate and Nitrite	Not specified
Sodium	< 500 mg/kg
Potassium	Not specified
Copper, Zinc, and Iron	Not specified
Ammonia	< 40 mg/kg as NH_4

The Proposed antiscalant treatment program should not impede the above chemistry control limits

5.1.2 The treatment programmes required include:

- Control of deposition /scaling by ensuring that minerals do not precipitate out of solution and form scales on the piping and heat exchanger surfaces (using an appropriate antiscalant/crystal modifier – in conjunction with the lime softening applied by the Employer). Including ashing system.

5.1.2.3 Control of corrosion, fouling of ash lines and associated water lines that may be prone to scaling range.

- The treatment program shall ensure that ash lines and associated water lines that may be prone to Scaling is protected against general Scaling.
- The scope includes management, operation and dosing as required to achieve the control of the aspects as stated above.
- The use of Deposited coupons is required as part of the monitoring program.
- The scope includes visual inspections and analyses to verify and check the efficiency of the treatment program during outages and maintenance inspections reports are mandatory.
- Monthly report of the condition and performance of the ash lines and associated water lines that may be prone to Scaling, proposed adjustments in the treatments and justification thereof.
- Modelling of the ash lines and associated water lines that may be prone to Scaling indicating anticipated reduction scaling potential of the water before and after treatment.
- Modelling results shall be compared to actual performance and reasons for deviations and proposed corrective actions provided to the Employer monthly.

The program and chemicals applied shall be compatible with all materials of construction (mainly carbon steel, PVC, HDPE, etc.) as well as any coating systems that have been applied in the ash lines and associated water lines that may be prone to Scaling.

5.1.2.2 Cooling water treatment

The cooling water system is typically operated at a cycle of concentration (CoC) ranging from 10 -15. These CoC are optimised based on the water quality. Cooling water side stream treatment consists of lime softening and turbidity control using flocculants. There is provision for sulphuric acid dosing for alkalinity control if lime is not available.

Blowdowns from the cooling water system are affected to the ash plant as part of the salinity and turbidity control (to release concentrated water from the system). This necessitates addition of fresh water to the system to make up for blowdowns and other losses such as evaporation and leakage. The use of water is optimised by recovering streams from other unit processes as indicated below:

Station drains or Wastewater Recovery (WWR) and ash Dam Seepage water may be recovered to Cooling system on the South where lime softening is applied as a treatment regime.

Each CW side has a raw water make-up supplied to it. Total estimated volume of CW is 24 to 30 ML/d and daily make up 10 to 15 ML/d South and 15 to 20 ML/d for North respectively.

The Contractor is to note that the quality and volume of these streams is variable and adjust the treatment applied based on prevailing conditions at the time of treatment, including taking into cognisance the blowdown and make-up rates.

5.1.2.3 Cooling water, ash lines and associated water lines are prone to scaling and deposition treatment and control programme is paramount.

The treatment programme shall ensure that typical scaling species such as calcium carbonate, calcium sulphate, calcium phosphate, barium sulphate, magnesium silicate, etc. are controlled well below saturation levels to prevent scaling and deposition on pipe and heat exchanger surfaces.

The antiscalent or crystal modifier proposed for use must not negatively affect the softening/precipitation efficiency of the lime softening process applied at the station.

The Contractor is required to evaluate/assess, select appropriate chemicals, and provide the recommended treatment programme to the Employer. The selected chemical should be able to control. and mitigate the scale propensity of a typical CW chemistry provided in table 2 and 3. The recommendations shall take into cognisance the requirements stated below:

- The antiscalent should have a threshold, crystal modification and dispersant properties.
- The antiscalent shall be effective at pH values ranging from 8 to 10.
- The antiscalent shall be stable / with stand temperatures between 35 ºC and 45 ºC.
- The antiscalent shall function effectively in systems with sulphate concentrations exceeding 1000 $mgkg^{-1}$ as SO_4.
- The chemical name together with the active ingredients and concentrations must be specified.
- A detailed 16-point Safety Data Sheet (SDS) shall be provided upon delivery. Contact details to be used in the event of an emergency (include a telephone number) must be provided.
- The supplier must provide a Certificate of Analysis (COA) that includes but is not limited to colour, pH and specific gravity.

- All drums and tanks of chemicals must be labelled as a minimum with the chemical name, shelf life or expiry date, the appropriate hazard warnings, and identification of respective manufacturer.
- The supplier must provide periodic site visits to ensure that the specified chemicals are being dosed optimally and the desired treatment outcome is achieved.
- The Supplier will be responsible for the removal of all Containers used and the disposal there off, this is in part of Housekeeping at the Hendrina Power Station.
- Blended chemical SHALL not be accepted.

5.3 Other requirements

- Ensure continuity of chemical treatment from day one of contract start date to contract end date or as decided by Hendrina Power Station.
- No down time due to chemical supply shall be accepted.
- Supply standard operating procedure for the dosing plant.
- Supply all safety equipment applicable to the process and where necessary/not available.
- Always comply with safety standards around the dosing stations, (e.g., with people and the environment. Zero spillages shall be maintained, should a spillage occur, such a spillage shall be cleaned by the Contractor before end of business)
- Be available 24hrs/day for any technical back-up assistance that might be required.
- Ensure the use of Accredited laboratory, for measurements and reporting.

5.4 Safety Requirements

The Contractor is to comply with the latest revision of the Eskom Generation Plant Safety Regulations, site specific procedures, and stipulations of the OHS Act.

5.5 Documentation to be Submitted by the Contractor

The following documents must be submitted with every delivery:

- Material data sheet as per OHSA requirements.
- Certificate of analysis.
- Weigh bridge certificate confirming the quantity delivered (Payment will be based on the results from the Eskom weighbridge unless not available).
- The delivered chemical should be labelled with the name and chemical spec as per the MSDS.

5.6 Quality Assurance Requirements

The Contractor is to be responsible to record and archive all off-site, factory tests and on-site tests.

6. Authorisation

This document has been seen and accepted by:

Name	Designation
Vhutshilo Mubilana	Supervisor
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7. Revisions

Date	Rev.	Compiler	Remarks
January 2025	0	Relebohile Tsotetsi	New Document

8. Development Team

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

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9. Acknowledgements

N/A