

	<p style="text-align: center;"><b>Scope of Work</b></p>	<p style="text-align: center;"><b>Technology</b></p>
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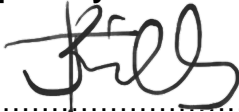
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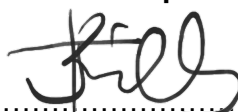


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### **CONTROLLED DISCLOSURE**

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## **1. INTRODUCTION**

Kriel Power Station (PS) uses resin to purify water from the following systems: Condensate Polishing Plant (CPP), Stator Coolant and Demineralization (Demin) plant.

CPP ion exchange resin is utilized as a mixed bed which has both cation and anion resin mixed in a single vessel. The resin bed purifies or polishes the returned condensate and removes corrosion products that will harm boiler and turbine equipment due to deposition. The deposits in the condensate system are particulate iron and copper. Low levels of other contaminants may enter the system through condenser and pump seal leaks or carry-over of boiler water into the steam. Condensate polishers filter out the particulates and remove soluble contaminants by ion exchange.

The Stator Coolant system uses dual column mixed bed resin, which consists of Na<sup>+</sup>/OH<sup>-</sup> mixed bed form and palladium in one vessel and H<sup>+</sup>/OH<sup>-</sup> mixed bed form in the second vessel. The mixed bed resin objective is to keep the stator water conductivity as close to pure water as is possible. Palladium coated resin should be 10% of the volume of Na<sup>+</sup>/OH<sup>-</sup> column, which will assist in minimizing the dissolved oxygen (DO) in the system for the low oxygen regime. Correct conductivity and DO control will minimize corrosion in the system. Stator resin change out is recommended at a frequency of eighteen (18) months or earlier as indicated by the deteriorating chemical parameters.

The Demin plant consists of three ion exchange vessels, which include a combination of strong acid cation resin (cation exchanger) and strong base anion resin (anion exchange) and a combination of the two (mixed bed exchanger). The cation unit exchanges hydrogen for the raw water cations and anion unit exchanges hydroxyl for raw water anions. The mixed bed resin polishes the water to high purity.

After the exhaustion of the CPP and Demin resin, the cation resin is regenerated using sulfuric acid and anion resin using caustic soda solutions.

## **2. SUPPORTING CLAUSES**

### **2.1 SCOPE**

This document provides the technical requirements for the supply and the delivery of ion exchange resin at Kriel PS.

#### **2.1.1 Purpose**

The purpose of this document is to detail the requirements for the supply and the delivery of ion exchange resin at Kriel PS for the period of five (5) years as and when required.

#### **2.1.2 Applicability**

This document shall apply to Kriel PS.

### **2.2 NORMATIVE/INFORMATIVE REFERENCES**

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

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### 2.2.1 Normative

[1] ISO 9001 Quality Management Systems

### 2.2.2 Informative

[2] Not applicable

## 2.3 DEFINITIONS

### 2.3.1 Disclosure Classification

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

## 2.4 ABBREVIATIONS

Abbreviation	Description
CPP	Condensate Polishing Plant
DO	Dissolved Oxygen
Demin	Demineralized
MSDS	Material Safety Data Sheet
PS	Power Station
SOW	Scope of work

## 2.5 ROLES AND RESPONSIBILITIES

Roles and Responsibilities are as follows:

- The Senior Chemist is responsible for drafting the SOW and circulating it to all the relevant stakeholders for review.
- Auxiliary Engineering and Chemical Services execution are responsible for reviewing the SOW to ensure that the consolidated scope will address plant challenges.
- The Contractor is responsible for executing the SOW.

## 2.6 PROCESS FOR MONITORING

The internal assurance will be done by the water treatment supervisor and the contracts manager.

## 2.7 RELATED/SUPPORTING DOCUMENTS

Not applicable.

# 3. SCOPE OF WORK

## 3.1 BATTERY LIMITS

The battery limits for this SOW are:

1. Demin Ion Exchange Resin
2. CPP Ion Exchange Resin
3. Stator Coolant Ion Exchange Resin

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## **3.2 TECHNICAL SPECIFICATIONS**

### **3.2.1 Technical Requirements**

1. Resins to be supplied required must be the same product and type as the resin currently installed in the plant. Resins required and volumes are in Section 3.2.2. The supplier shall submit a letter to inform that they understand the requirement.
2. The supplier shall indicate their lead times for resin supply.
3. The supplier shall indicate the services that they will provide in this contract.
4. Provide batch numbers for all resin products delivered to Eskom, for traceability during troubleshooting.
5. All ion exchange resin products must be supplied in pallets of 25 litres bags amounting to 1000 litres.
6. All ion exchange resin products must be delivered in an open loaded truck to allow accessibility by the forklift during offloading.
7. Cation and anion resins used in demin mixed bed must be designed to operate as pairs, to ensure good resin separation and minimize resin cross contamination.
8. The demineralization mixed bed resin must have the following polymer matrix type:
  - Cation resins: a styrene cellular strongly acid resin.
  - Anion resins: a styrene microporous strongly basic type 1 resin.
9. The demineralization mixed bed must have the following total exchange capacity and form:
  - Cation resins must be supplied in hydrogen form with capacity greater than 2.0 eq/l.
  - Supply anion resins in the hydroxyl or chloride form with a capacity of greater than 1.0 eq/l.
10. Both cation and anion resins supplied must have perfect beads exceeding 99% and broken beads must be less than 1%.
11. The uniformity coefficient for both cation and anion resin must be less 1.2. 90% of the resin beads must be in the range of 0.60 – 0.70 mm.
12. The condensate polishing plant resin must have the following total exchange capacity and form:
  - Cation resins must be supplied in hydrogen form with capacity greater than 2.0 eq/l.
  - Anion resins must be supplied in the hydroxyl form with a capacity of greater than 1.0 eq/l. The chloride content must be less than 1% and the hydroxyl content must be greater than 95%.
13. Both cation and anion resins supplied must have perfect beads exceeding 99% and broken beads must be less than 1%.
14. The uniformity coefficient for both cation and anion resin must be less 1.2. 90% of the resin beads must be in the range of 0.60 – 0.70 mm.
15. The following documents shall be submitted to Kriel personnel at Stores upon arrival at the power station:
  - Ion exchange resin certificate of analysis and batch numbers.
  - Delivery note, which must include the Eskom order number, the name of the power station and the power station address.
16. The safety data sheets (SDS), and/or technical data sheet (TDS) must be provided per product.

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### 3.2.2 Quantities Requirements

Stock Number	Resin Type	Total Requirements
501231	Demin Cation - Amberlite HPR 1200 H+	14000
198167	Demin Anion - Amberlite HPR 4811 Cl	14000
211749	Demin Mixed Bed Cation - Amberlite HPR 1600 H+	4400
501211	Demin Mixed Bed Anion - Amberlite HPR 9000 OH	4400
157280	Stator Coolant Cation - Amberlite HPR 650 H	1000
217702	Stator Coolant Cation - Amberlite HPR 1300 Na+	1000
157285	Stator Coolant Anion - Amberlite HPR 550 OH	1000
211749	CPP Cation - Amberlite HPR 1600 H+	30800
501211	CPP Anion - Amberlite HPR 9000 OH	20000

## 4. AUTHORISATION

This document has been seen and accepted by:

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Sidwell Muthavhine	Chief Scientist

## 5. REVISIONS

Date	Rev.	Compiler	Remarks
December 2023	0	N Kolobe	Draft Document
March 2024	1	J Pillay	Final Document for authorization

## 6. DEVELOPMENT TEAM

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

- Nqobile Kolobe
- Jerushan Pillay

## 7. ACKNOWLEDGEMENTS

Not applicable.

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