Eskom	MATLA POWER STATION SCOPE OF WORK	Template Identifier	240-43921898	Rev	6
		Document Identifier	14593	Rev	4
		Effective Date	October 2019		
		Review Date	October 2022		

PLANT AREA: Matla Power Station

TITLE: Scope of Work for supply and delivery of chemicals for main cooling water system North and South Microbiological control at Matla Power Station on an as and when required basis for a period of five (5) years

REF: MEP-051307	**Reference Rev No:1**	**MULTIDISCIPLINARY: No**	**Plant Level: All**
COMPILED BY	***Name: Maria Majake*** ***Contract Manager***	Signature M.M. Majake	Date 2021-04-22
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REVIEWED	***Name:*** Tshamano Nemaguvhuni ***Quality Department***	Signature	Date 29/04/2021
REVIEWED	***Name:*** Shareen Ramaboea ***Environmental Department***	Signature	Date 29.04.2021

ACCEPTED	*Name: Stanley Motha* *Chemical Services Manager*	Signature	Date

NB: Do not tamper with the template.

GENERAL

- Data books, reviews, reports and diagrams/drawings shall be submitted to Engineering after the completion of the work Engineering to forward the data books to Quality Department (Document Control)
- All QCP's to be submitted to Engineering and Quality for approval prior to outage/project or maintenance work commencement.

	SCOPE OF WORK DESCRIPTION / ACTIVITY	PROCEDURE, SPECIFICATION, ENG. REQUIREMENTS / DOCUMENTATION	HOLD POINTS, WITNESS, REPORTS	RESPONSIBLE PARTY
1.1	Safety	• All work is to be done in accordance with Matla plant procedures and safety regulations. (GGR 0992) • Matla power station induction must be done before any work commences. • Permit to work must be in place before any work commences. • Worker's register must be completed and daily risk assessment conducted before any work commences.	Eskom to witness.	Contractor
1.2	Environmental Management. .	• All activities listed in the National Environmental Act 107 of 1998, EIA Regulations as amended, must have environmental **AUTHORISATION** before commencement of work. • The contractor shall comply with all applicable legal and other requirements. • The polluter pays principle will be applied. • The contractor manager shall ensure compliance with Eskom Matla Environmental procedures to ensure the prevention of pollution (refer OMOP 4090 and 4402). • The last payment will be processed based on the status of the last housekeeping check sheet (Annexure C OMOP 4402) of designated area • EMS file based on ISO14001 will be required.	Eskom to witness.	Contractor

1.3	Quality Management	• The contractor/executioner of work will be responsible for drawing up all QCP documentation and this must be approved by engineering and authorised by the Quality Department before commencing with the work. • Contractors/executioner to adhere to QM 58 and OMOP4497 requirements • Number of NCR issued can affect your next tendering process • The QCP shall be signed progressively by the Engineer/Supervisor, Eskom QC Inspector, Contractor QC Inspector and/or AIA. • No procuring of outage items without the approval of scopes by quality • All outage scopes creep and scopes addition should be approved by quality • No contractor should be in the possession of scopes for execution without the scopes approved by quality • The contractor is subjected to quality auditing at any point in time during execution of scope	Hold point	Contractor
1.4	Inputs from other departments			
1.5	Commissioning reference			

	SCOPE OF WORK DESCRIPTION / ACTIVITY	PROCEDURE, SPECIFICATION, ENG. REQUIREMENTS / DOCUMENTATION	HOLD POINTS, WITNESS, REPORTS	RESPONSIBLE PARTY

	SCOPE OF WORK DESCRIPTION / ACTIVITY	PROCEDURE, SPECIFICATION, ENG. REQUIREMENTS / DOCUMENTATION	HOLD POINTS, WITNESS, REPORTS	RESPONSIB LE PARTY
1.	**System Description**			
1.1	**SYSTEM INFORMATION:**	South system volume = 47 ML North system volume = 47 ML Blowdown volume = 5 ML/D per system (at MCR) Average raw water make-up = 60 ML/D per system (at MCR) CoC (based on SO_4) = 16 Cooling water Temperature range 0 – 45 °C System operational chemistry state and chemical specification as per Eskom Standard provided in Appendix A.		
1.2	**FLOW DESCRIPTION (see Appendix for basic flow diagram):** • Matla has 2 similar CW systems – North and South CW system, which are independent of each other Each			

	system has 3 cooling towers and 3 operating units. • The raw water make-up used for the cooling water systems feeds directly to the cooling tower ponds and originates from the Vaal water scheme. • About 10% side stream treatment of the concentrated cooling water is done per system. The side treatment includes lime treatment (calcium hydroxide) controlled between pH 9 8-10.3 for alkalinity removal and coagulant and flocculant dosing for clarification. • The cooling water is circulated at a maximum flowrate of 14.36 m^3/s (South CW system) or 13 m^3/s (North CW system), through the condensers and back to the cooling towers. The flowrate is dependent on the number of CW pumps running (max 6 pumps per system), which is dependent on the number of operating units on-load.			
1.3	**MATERIALS OF CONSTRUCTION:**	Deformed H T. reinforced concrete (Class A, B & C) Carbon steel Mild steel Cast iron Titanium tubes Brass tubes Polygrid splash on South Cooling Towers and flat asbestos-cement sheets on North System		
1.4	**POSSIBLE DOSING POINTS:**	Centre well Fore-bay		

1.5	OTHER DOSING CHEMICALS:	The optimal dosing point(s) will be determined by the selected supplier and the client after contract award. Lime (Calcium hydroxide) Crystal modifier Flocculent & Coagulant The chemical constituents of all dosing chemicals will be communicated during contract phase.		
2.	**Detailed requirements**			
2.1	Chosen tenders shall be allowed a test period on the system to prove the effectiveness of the suggested product. Time of test period will be negotiated. An order will be placed at the quoted rates for the test period to treat a specific volume. For the trial period, own dosing equipment must be supplied and a trial run report must be submitted within one week of the trial run completion.			
2.2	Two biocides with different modes of action against bacteria should be provided. It is preferable to have one oxidising and one non-oxidising biocide, although this is not essential, as long as different modes of action are absolute.			
2.3	The biocides should be dosed in an alternating regime to ensure that the resident bacteria do not develop biocidal resistance.			
2.4	This dosing should initially be every second day, to remain within the efficacy range of the biocide. Once the system is under control, the concentration of biocide being dosed may be			

2.5	decreased but it is recommended that the dosing be maintained every 2 to 3 days at a maximum.			
2.6	Efficacy test of dosing for the biocides should be provided, an acceptable kill rate will be 99.99% of total planktonic bacteria within the system, after optimal time for the biocide used.			
2.7	A biodispersant should be provided with continuous dosing and the supplier should supply the dosing pumps and other required equipment.			
2.8	The supplier must advise on the correct regularity and concentrations of treatment chemicals to be dosed to maintain the CW specifications at all times.			
2.9	Suppliers will be required to complete Power Station induction training to operate on site.			
2.10	Chemical MSDS's Certificates of Composition must be submitted with each delivery. Eskom reserves the right to randomly check the products submitted			
2.11	All drums and tanks of chemicals must be labelled with the name, use and safety information of the chemical. Contact names must be available in the event of a chemical spill.			
2.12	Equipment failures must be rectified by the supplier within 24 hours of being notified of the problem.			

2.13	The supplier must conduct a minimum of weekly plant visits to ensure tank levels and dosing equipment is fully functional.			
2.14	The supplier will ensure that the chemicals supplied do not affect the materials of construction within the CW system (concrete, rebarring, heat exchanger tube metals (titanium & brass), stainless steel or mild steel).			
2.15	The supplier must install or utilise on-line equipment for monitoring of sessile bacteria proliferation and biofilm formation This equipment must be readily inspectable.			
2.16	A 6 month probation trial will be conducted after contract award, if the dosing regime maintains the system as required the contract will be allowed to run its full term. If after the 6 month trial the supplier has not managed to control the system, Eskom has the right to terminate the contract			
2.17	All Eskom SHEQ policies are to be followed when the supplier is on Eskom sites.			
2.18	The supplier is expected to supply and dose the chemicals. Optimal dosing and measuring points should be identified.			
2.19	Appropriate product storage facilities should be identified and utilised for proper chemical storage as per regulations.			
2.20	All appropriate safety requirements should be enforced during dosing activities.			

2.21	The supplier is expected to give technical backup on the products and their correct application			
2.22	The supplier will be notified on any changes in make up water quality to the cooling water system, seasonal variations in the cooling water system or the recovery of different effluents which may affect the water quality in the cooling water system. The supplier will have to respond by making necessary adjustments to the system for optimal treatment.			
2.23	The supplier must sample the CW system before and after dosing (at a representative time for the biocide efficacy) and submit them to an accredited Microbiology laboratory for total aerobic, total anaerobic and hydrogen sulphide producing bacteria (as per the CW standard), in both planktonic and sessile conditions, to prove the biocide and dispersant dosing is effective. The minimum efficacy is 99.99% kill at the optimal kill time for the biocide. These results must be reported to the PS regularly (preferably on a weekly basis but a minimum of once monthly).			
2.24	The supplier must analyse for Legionella, according to the ISO methodology, on a quarterly basis. The Legionella count must be below 10 000 CFU/L. The supplier will give a minimum of quarterly feedback to the chemistry staff of the PS on the status of the dosing regime.			

BILL OF MATERIAL

	Full description Material/Spares/Equipment	Specifications of Material/Spares/Equipment	Stock No	Part Number	Required Quantity
1	2 x biocides to be slugged dosed throughout contract period	Two biocides (oxidising and non-oxidising) with different modes of action against bacteria should be provided			As per supplier specifications
2	1 x biodispersant to be dosed continuously throughout contract period				As per supplier specifications
3	Biodispersant dosing system to be provided	Tanks, pipes, valves, pumps			As per supplier specification
4	Online monitoring equipment	Monitoring of sessile bacteria proliferation and biofilm formation			As per supplier specification

APPENDIX A

Raw water quality (95th percentile data from Jan 2018 – Feb 2021)

Parameter	Unit	Value
Turbidity	NTU	46
pH		8 6
Conductivity	uS/cm	326
M-alkalinity	mg/kg $CaCO_3$	98
Calcium hardness	mg/kg $CaCO_3$	54
Magnesium hardness	mg/kg $CaCO_3$	59
Total hardness	mg/kg $CaCO_3$	113
Sodium, Na	mg/kg	22
Potassium, K	mg/kg	8
Reactive Silica, SiO_2	mg/kg	15
Chloride, Cl	mg/kg	14
Sulphate, SO_4	mg/kg	47
EMA		60
Organic Acid, OA		13
Langelier Index, LI		0.4
Total Organic Carbon (TOC)	mg/kg	9

Cooling Water quality (95th percentile data from Jan 2018 – Feb 2021)

Parameter	Unit	Value	South CW	North CW
CW Turb	NTU	<100	74	71
CW pH		8.1 - 8 6	8.76	8.81
CW K25	uS/cm	<4000	3340	3430
CW P-alk	mg/kg	<7.5	16	20
CW M-alk	mg/kg	120 - 160	190	191
CW CaH	mg/kg	200 - 500	517	453
CW MgH	mg/kg		335	441

CW TH	mg/kg		750	759
CW Na	mg/kg	<500	489	499
CW K	mg/kg		126	138
CW Cl	mg/kg	<400	370	380
CW SiO2	mg/kg	<150	48	39
CW SO4	mg/kg	<1000	1143	1162
CW Mg*SiO2		<25 000	11769	10336
CW CCPP		10 - 45	64	61

Cooling water specification as per Eskom Chemistry and Microbiology Standard for Cooling Water 240-55864767 Revision 4

Parameter	Unit	Spec	Target
pH @ 25°C		8.1 – 8.6	8.1 – 8.5
Conductivity	µS/cm	< 4000	2800 – 3000
Turbidity	NTU	< 100	< 50
P-alkalinity	mg/kg $CaCO_3$	< 7.5	< 5
M-alkalinity (with crystal modifier)	mg/kg $CaCO_3$	120 – 160	120 – 160 *
Calcium hardness	mg/kg $CaCO_3$	200 – 500	200 – 400
Permanent hardness	mg/kg as $CaCO_3$	< 400	
PO_4^{3-}	mg/kg as P	< 0.5	< 0.5
NO^{3-}	mg/kg as N	1	< 1
SO_4^{2-}	mg/kg $CaCO_3$	< 1000 if Na^+ > 250 < 750 if Na^+ < 250	< 1000 < 750
Cl	mg/kg	< 400	< 400
Sodium	mg/kg as Na	< 500	
Reactive Silica	Mg/kg as SiO_2	< 150	
Mg X SiO_2	mg/kg	< 25000	< 23000
OA	mg/kg	< 20	
COD	mg/kg	< 200	
Ammonia	mg/kg as NH_4	< 40	

Scaling Potential Calcium Carbonate precipitation potential (CCPP) at 38°C	mg/kg as CaCO3 with a crystal modifier	10 - 45	<40

* WITH THE USE OF A CRYSTAL MODIFIER

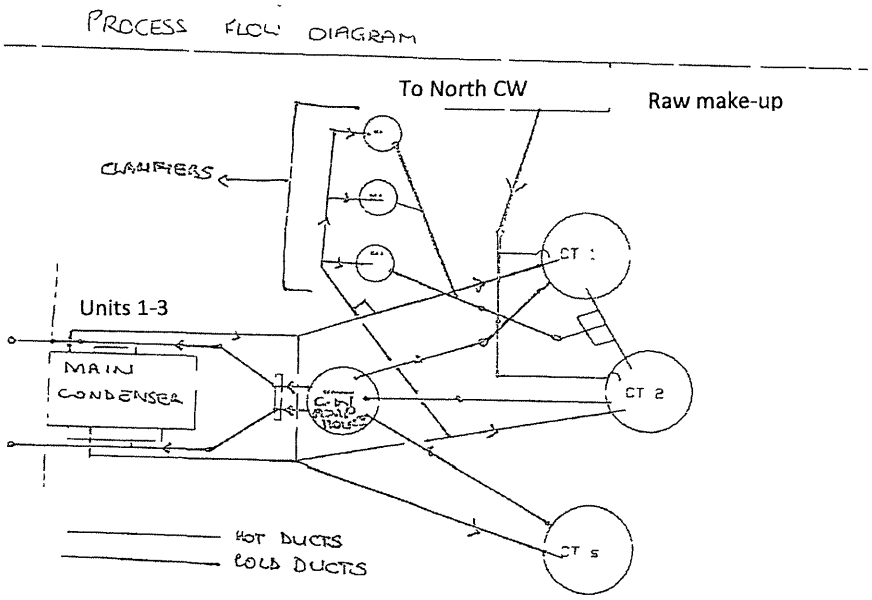
Bacteriological Quality (Planktonic) specification as per Eskom Chemistry and Microbiology Standard for Cooling Water 240-55864767 Revision 4

PARAMETER	UNIT	SPEC	TARGET
Total aerobic bacteria	CFUs/ml	$<10^5$	$<10^4$
Total anaerobic Bacteria	CFUs/ml	$<10^4$	$<10^3$
Total Coliforms (TC) When treated sewage is recovered to the CCW system(s).	TC per 100 ml	Not Specified	Not Specified
Faecal Coliforms (FC) When treated sewage is recovered to the CCW system(s).	FC per 100 ml	Not Specified	Not Specified
Faecal Streptococci (FS) When treated sewage is recovered to the CCW system(s).	FS per 100 ml	Not Specified	Not Specified
Legionella	Counts	<10 000 CFU/L	<100 CFU/L
H_2S producers	CFUs/ml	< 50	< 50
Chrorophyll A	µg/kg	< 25	< 25

Bacteriological Quality (Sessile)

PARAMETER	UNIT	SPEC	TARGET
Total aerobic bacteria	$CFUs/cm^2$	$<10^5$	$<10^5$
Total anaerobic Bacteria	$CFUs/cm^2$	$<10^3$	$<10^3$
H_2S producers	$CFUs/cm^2$	< 100	< 60

PROCESS FLOW DIAGRAM FOR THE SOUTH COOLING WATER SYSTEM



Note: The North CW system flow diagram is similar to that of the South CW system

SCOPE COMPILATION REFERENCES				
SOURCE & Ref No.	**Yes**	**No**	**N/A**	**Comments**
Previous outage service reports				
Return to service data packages				
Maintenance Strategy with Rev number				
SAP defects (attach list as appendix)				
GHRMS (STEP) reports (Generation Heat Rate Management System)				
Online Condition Monitoring				
Pre-outage performance test results				
Post outage performance test results				
GPSS/ Plant Performance data on UCLF incurred				
OMS / IIRMS recommendations (Audits Reports)				
Risk controls (IRM system)				
Previous audits and reviews (e.g. ERAP)				
Engineering Change Requests (Projects)				
LOPP strategy reports				
URS				
Philosophy (Outage)				
Condition Monitoring Report				

VA/PHD Viewer trends				
Corrective Actions				
CARAB reports				
Statutory Requirements				
Grid code requirements				
Waivers and Exemptions				
Calibration requirements				
Previous Outage SOW variations				
Post Mortems Actions from previous outages				
Pre–Outage plant walks				
Risk based inspection (RBI) report				
Simulation, TOIs, OON, SI				

COMMENTS

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