

Scope of work for Cooling Water Treatment. (2X525 MW. IPP)

Scope of work

Sub: Cooling Water Chemical Treatment at CW System of 2X525 MW units as per SOW, terms & Conditions for 365 days duration.

- **INTENT OF THE SPECIFICATION**

The intent of this specification is to select suitable chemicals for effective control of C. W. System of 2X525 MW. as described herein after to ensure the performance guarantee requirements mentioned, to control scale/deposit, corrosion and microbiological fouling. The scope of work includes supply of selected chemicals and monitoring instruments with accessories, operation and maintenance of the chemical injection systems and producing monitoring report on daily, monthly, quarterly, and yearly basis by the Bidder for the contract period.

System Details:

System Description of Circulating Cooling Water System:

There is continuous circulating cooling water mainly for steam turbine condenser cooling (Shell & Tube Condenser, SS tubes). There are IDCT (Induced Draft Cooling towers), with common bay, in the circuit to eliminate the heat load and cool the water for supply to condensers & heat exchangers. The make-up water for circulating water system is met from clarifier output (Pre-treatment plant), and raw water to clarifier is drawn from the Maithon Reservoir. An **Acid based; Ortho Phosphate Free** treatment program of the cooling water is required to operate the circulation water within the range of **7.0-9.0 (average 8.0) COC**.

Technical details of system & water quality are given below for reference.

System details:

Type of cooling tower	Induced Draft
Delta Temperature (ΔT) across the Cooling Towers	Max 10.0 °C
Water Flow Rate (Circulation)	1,32,000 m ³ /Hr.
CW water holding volume	1,20,000 m ³
Cooling tower inlet temp	43.1 °C
Cooling tower outlet temp	33.1 °C
COC	7.0-8.0
Cooling Media	Corrugated PVC fills
Metallurgy	MS, SS

Water quality parameters (Clarified Make Up)

Parameter	Unit	Make up water
pH	-	6.9-7.8
Conductivity	μS/cm	140-250
Turbidity	NTU	< 10

Suspended Solids	ppm	< 15
Total Hardness	ppm as CaCO ₃	50-100
Ca-Hardness	ppm as CaCO ₃	30-65
Mg-Hardness	ppm as CaCO ₃	20-35
Total Alkalinity	ppm as CaCO ₃	40-90
Chloride	ppm	10-20
Silica	ppm	11-16
FRC	ppm	0.2

Scope of Work

The scope of contract can be briefly defined as to maintain the desired water parameters of **condenser** cooling water throughout the tenure of the contract will be one year. To achieve the parameters scope of work shall broadly include the following:

- **Online Monitoring:**
- **Automation of cooling water management is mandatory & needs to be part of the offering.**
- **The automation platform should include online monitoring of pH, ORP, Turbidity, Conductivity & Residual Levels of scale & corrosion inhibitors used in the treatment program. Online system should have visibility of makeup water quality in terms of pH, ORP & Conductivity to have a real time control on the cooling water.**
- Bidder's automation platform should be capable of automating the product dosages based on residual levels for Scale & Deposit inhibitors as well as Dispersant in the system at any given point in time. **Online residuals of both Scale/Deposit Inhibitor & Polymeric dispersant (High stress polymer / Tar Polymer) should be measured and displayed all times, separately.**
- The Bidders Automation platform should be able to communicate upsets & send instantaneous alarms to site representative & customer via SMS / emails.
- **Bidders technology Platform for Automation should be capable of generating online reports & graphs of monitoring parameters at a desired frequency (Weekly, fortnightly, monthly/ quarterly)**
- **Online monitoring instruments (Part of the Automation technology platform) should be capable of displaying trends of monitored parameters at site.**
- Online Monitoring and control System should have extra analog and digital input facility to hook additional parameters for process related monitoring if any.
- Customer should have access (online & offline) to data collected by the automation platform.
- **Online automation should be supported by remote monitoring team of experts in water management on a continuous basis.**
- The responsibility of operation & maintenance of the Automation technology platform will be solely of the bidder.

- Vendor / Bidder to provide references of successful installation of proposed automation platform with above features at 2 or more Thermal power plant locations.
- MPL would speak to the concerned Thermal power stations / Visit the facility to validate the details provided by vendor.
- Bidders have to quote the price by splitting the Chemical cost (inclusive of cost of online and offline instruments) and services.
- **Supply of chemicals:**
Supply of the required chemicals for the treatment of cooling water & dosing them into the system as per schedule.
- **Corrosion Monitoring:**
Monitoring of the corrosion rate on MS & SS Metal coupons at 30 days exposure by providing Corrosion rack with coupons.
- d. **Scale Monitoring:**
Monitoring of the scale rate by installation of DDMs (Dynamic Deposit Monitors).
- e. **Biological growth monitoring:**
Monitoring of bacterial count on fortnightly basis by Bactaslides and the results will be submitted on monthly basis.
Complete Microbiological analysis of Recirculating water & make up water to be carried out by any government approved laboratory once in 6 Months.
- f. **System Inspection:**
Complete Cooling Water System inspections to be done during shutdowns. A report to be made to summarize the conditions of the equipment (Condenser and other heat exchanger related with CW Water) ,pipelines and Cooling tower.

Chemistry based performance parameters

These are identified as the ones that need to be controlled & maintained within the limits to ensure long-term integrity of the plant. The parameters fall under this category are:

- **Scale control:** This parameter to be monitored through deposit monitors; spool pieces and monitoring the online condenser differential pressure (DP). The condenser deposit analysis also should give positive feedback regarding the treatment.
- **Silt deposit control:** Since the Cooling water system does not have any Side stream filtration associated with it to manage fouling related challenges, it is recommended that the bidder would maintain the minimum active concentration levels of the following chemicals in the cooling water system at all times. The amount of silt in the cooling tower basin will be a measure of the effectiveness of control of this parameter.
- **Bio fouling control:** The treatment Programme should provide for bio fouling control, which has the potential to further lead to the corrosion and deposit. The chief method for monitoring would be the installation of a bio fouling monitor. This can also be monitored indirectly by the total bacterial counts (TBC)/ sulphate reducing bacteria (SRB) studies in the laboratory and by the cooling tower inspection.
- **Corrosion control:** The metals in the cooling water system need to be protected from corrosion. The chief concern will be the protection of the SS condenser tubes as well as mild steel pipes in the system. The MS & SS corrosion rates to be monitored through the standard method of test coupons. Condensator deposit analysis should reveal that iron is not corroding at

an excessive rate. Microbiologically induced corrosion also needs to be addressed by the treatment Programme.

Plant technical performance parameters

The most important component in the cooling water system is the condenser and the cooling tower. Regular & meticulous monitoring of condenser differential pressure and vacuum needs to be put in place. The performance of the cooling tower needs to be monitored as well. Following parameters to be

1. Condenser Tubes & all Auxiliary systems must be free from water borne mineral scale & algae.
2. Cooling tower fill must be free from water borne mineral scale, ambient foulants & algae.
3. Drift eliminators also be free from algae & water borne mineral scale.
4. Water distribution system must be free from algae & water borne mineral scale.

Vendor to specify the dosages envisaged and the frequency of such chemicals in their program design. No deterioration of CT efficiency would be accepted during treatment program.

Reporting requirements

The cooling water treatment provider shall submit a daily, weekly and monthly report. This report shall include results of laboratory analysis, online monitors and condenser and cooling tower performance data. Any joint inspection of the system carried out shall also be reported. Chemical consumption details including supply, stock and balance quantities etc. shall be provided in the report. The report shall make recommendations, wherever necessary, for the improvement of the system. The reporting format, sampling interval, number of samples & time of sampling should be mutually agreed upon after discussion.

Mandatory Requirements:

- Cooling Water Treatment
- Cooling water Chemistry need to be monitored and maintained on 24x7 basis and analysis reports along with reading from control room to be submitted on daily basis.
- **Vendor must suggest & implement any digital (in line with Industry) intervention for condenser performance monitoring with help of M/s. MPL.**
- Operation of all Chemical dosing pumps, Dosing of chemical, System monitoring, generating reports, Water analysis related to Cooling water treatment by qualified and experienced manpower. (BSc/Diploma with 4 years /MSc/B-Tech with 2 years' experience).
- To maintain the water quality and to meet the scope of the treatment if at any case, the quantity of the chemicals exceeds than the projected quantity, vendor must supply required addition quantities without raising any extra financial implication to MPL.

- Shifting, unloading and safe custody of the Chemicals at MPL site will be at vendor scope. The Chemical shall be supplied in seal and portable carboys. Loading of empty carboys/jerry shall be in Vendor scope. Vendor shall return all the empty Carboys at their own cost of convenience. Vendor shall ensure disposal of empty carboys/jerry in eco-friendly manner, outside the premises of MPL. MPL shall not be held responsible in the event of any dispute arising out of disposal.
- Lab. facility for water parameter testing will be provided by MPL, however in case for any test suitable facility is not available in MPL lab, supplier shall provide the facility for these testing.
- All the monitoring & measuring kits like coupons, slides etc. with relevant ASTM specification is to be provided by party.
- Regulation of water quality and dosing schedule to ensure compliance to treatment control limits.
- Supply of dosing pumps for chemical dosing will be done by party.
- Shifting and dosing of Chemicals should be in the scope of Vendors.
- PPE should be provided by Vendor to their representative workman. PPE need to fit for handling CW treatment chemicals like Sulphuric acid, Chlorinated water and specialty chemicals used in treatment.
- MSDS should be displayed at chemicals storage area.
- Monitoring of dosing pumps and its maintenance will be done by vendor.
- All the chemicals those shall be supplied by vendor should be eco-friendly and have no adverse effect on the RO Plant (feed as CT BD water) and lime soda treatment process.
- The treatment programmed should be complete package as follows:
 - Strong & Effective Polymeric Dispersant suitable for high Holding Time Index (HTI) in higher COC.
 - Strong & Effective Scale Inhibitor suitable for high Holding Time Index (HTI)
 - Suitable Corrosion Inhibitors for high Holding Time Index (HTI) in higher COC..
 - Suitable strong Bio Dispersant having foaming property.
 - Effective Non-oxidizing biocides suitable for high Holding Time Index (HTI).
 - Non-Oxidising Biocide will be dosed once in every quarter (once in every three months interval). Two types of NOBs should be considered (to avoid immunity), and each should be dosed once in alternate quarter. However, the make-up water will be chlorinated.
 - All chemicals will be supplied as liquid product in good quality new plastic (HDPE) drums of small pack size for easy handling.
 - Material should be supplied MATERIAL SAFETY DATA SHEETS and all the chemicals should be easily biodegradable, non-toxic & non-chromate based, so that no special treatment needs to be done before discharge or taken to the other processes.
 - Treatment should be based on pH 7.8 - 8.2.
 - 98% Sulphuric acid and Liquid Chlorine or Sodium Hypochlorite will be provided by MPL.
 - Chlorine dosing will be done in General shift only, however the make-up water will be chlorinated.

- Treatment program is to be designed for 8.0 COC (on yearly Average), however the CW system will be operated @ 7 to 9 COC; however chemical will be dosed on actual COC basis to take care of residual design parameter at low COC and also take care of high stress at high ionic load due to high COC.
- The bidder should engage 3 nos. competent manpower to operate /analyses/monitor/report the chemical dosing system, in the General & C shift only without any interruption.
- CT Fills Treatment

Since CT fills fouling by fly ash ingress is affecting the power plant efficiency, so we need laser sharp focus for preventing CT fills fouling. Additional to the above, vendors should consider suitable special CT fills cleaning chemicals additionally, which would be dosed continuously / periodically to prevent CT fills fouling. Since there are no SSFs, the used formulation should be also capable of preventing the foulants from depositing/fouling the HEX. The chemical should not have deleterious effect on any components of entire CW system (like metallurgies, PVC Fills Nozzles etc) , whatsoever.

The efficacy of the used formulation being used for CT fills treatment will be assessed:

- by continuously passing the treated water through a pilot cooling tower and inspecting its fills periodically,
- Cooling Tower efficiency and
- Approach measurements.
- Complete certification of same chemicals

Vendor should provide references of their formulation for this particular application. This is mandatory.

Cooling water Chemistry:

Parameters Range

DATA SHEET FOR CIRCULATING WATER TREATMENT SYSTEM			
Sl. No.	Control Parameters	Unit	Control Limits
1.1	pH		7.8 – 8.2
1.2	Conductivity	μS/cm	<3000
1.3	Turbidity	NTU	<20
1.4	TDS	ppm	<2000
1.5	M. Alkalinity as CaCO ₃	ppm	<550
1.6	Total hardness	ppm	<600
1.7	Calcium as CaCO ₃	ppm	<375
1.8	Magnesium as CaCO ₃	ppm	<200
1.9	Chloride as Cl	ppm	<250
1.10	Silica as SiO ₂	ppm	<130
1.11	Soluble Iron as Fe	ppm	<0.5
1.12	Sulphate as SO ₄	ppm	<500
1.13	COC		7 – 8

1.14	Corrosion rate on MS	MPY	<2.0
1.15	Corrosion rate on SS	MPY	<0.1
1.16	TVC	Counts/ ml	<1x10 ⁴
1.17	SRB	Counts/100 ml	<100
1.18	Iron Reducing Bacteria	Colonies/ml.	<100
1.19	Residual Zinc	ppm	0.5 – 1.0
1.20	Residual Organic Phosphate	ppm	0.8 – 1.5

Qualifying requirements for Bidder:

In addition to the requirements stipulated in clauses mentioned in the general & technical specification, Bidder should also meet the qualifying requirements stipulated hereunder:

- a) The Bidder should have designed, supplied chemicals, and provided services for such Cooling Water Treatment Packages consisting of Recirculation rate of minimum 60,000 m³/hr. for a single TG of at least **500 MW**. power generating unit, which should be in successful operation for at least 2 years at the time of bid opening. The contract should have online automation system (as stipulated)
- b) Certificates of Credentials should be submitted along with the offer subjective to our ready reference.

MPL reserves the right to reject any or all bids or cancel/ withdraw the enquiry/requirement without assigning any reason whatsoever and in such case no bidder shall claim any claim arising out of such actions.

TECHNICAL SPECIFICATION FOR CW TREATMENT PROGRAM

2.04. As the cooling water blow down will be treated in RO based ETP Plant. So, the treatment chemicals should be based on having no adverse effect on RO membrane and Soda lime treatment of ETP / **CT BD** - RO plant.

2.05. Cooling water treatment chemicals should not contain any harmful chemical components which violate environment norms of CPCB & JHPCB.

3.00 SCOPE OF SUPPLY AND SERVICES

The Bidder shall supply the following items under their scope of supply:

- Supply of required chemicals for CW treatment for 365 days of operation for set of 2 X 525 MW units. Supply of chemicals required for pre-cleaning & passivation of entire C.W. Treatment System of 2X525 MW C.W. System prior to start the regular treatment shall be under Bidder's scope and Bidder should quote separately for the same along with the method of P&P.

ii. The treatment regime shall broadly consist of the following:

Please refer to Schedule I.

The bidders are requested to submit the Techno -commercial proposal for all the above schedules. This is required considering variation in makeup water quality.

iii. Instruments/ monitoring equipment's to be supplied as tabulated below:

1. Online Automation system for system monitoring and control of Chemicals 24X7.
2. Scale Deposit monitor 2 Set (individual Condenser CW water outlet line)
3. Bio fouling Monitor 2 Set (individual Condenser CW water outlet line)
4. Portable ORP meter 1 Set
5. Corrosion test rack (complete in all respect) 2 set (individual Condenser CW water outlet line)
6. Online digital corrorator (to be a part of the online automation system).
7. Test Coupons (MOC-MS, SS) Sufficient for monthly monitoring.

iv. Supplier is required to depute qualified & competent manpower with suitable working experience in Cooling water treatment & chemical dosing system (as specified above), and subsequent reporting General shift and monitoring online 24X7 through online automation system for execution of contract and performance guarantee tests.

v. Bidder shall also supply required numbers of electronic reciprocating pumps for proportionate dosing of chemicals. The pumps so supplied will be supplied on returnable basis.

vi. Necessary daily report, weekly report & monthly report with all the relevant/required data regarding the treatment shall be furnished to MPL officials.

vii. Arrange for dispatch of all the material to sites on F.O.R on Door Delivery Basis.

viii. Receiving of all materials at site, checking with consignment note and reporting for missing or damaged items.

ix. Proper stacking, storing under Contractor's custody, providing proper maintenance Of stored items and keeping proper records of materials. Storage and chemical handing area need to maintain as per guidelines of 5S otherwise penalty will be impose as per condition.

xi. Bidder shall maintain the minimum 01 months chemical inventory at MPL site.

xii. Bidder shall furnish the QAP/Internal Inspection Reports/Data Sheet/ necessary quality assurance/MSDS procedures for all the chemicals along with dispatch documents for MPL's record.

xii. The entire used Chemical container, jerry-canes etc. shall be provided on returnable basis.

xiii. Contract shall be awarded for a period of one-year operation for CW treatment Program. However, purchaser will review it on six monthly basis. MPL reserves the right to terminate the contract without assigning any reason whatsoever and such termination will be without any obligation on MPL side.

xiv. The instrument/equipment supplied by the party as mentioned in clause 3.00 subsection (iii) are supposed be provided on returnable basis and may be withdrawn in case of discontinuation of the contract.

xv. Cooling Tower treatment program shall be designed on operating COC at an average of 8.0.

xvi. Necessary back-up calculation for dosages/consumption of Scale Inhibitor Solution, and Corrosion Inhibitor Solution & Bio dispersant, Biocide, Sulphuric Acid & Chlorine etc. shall be furnished along with the offer clearly indicating the drift losses, bleed, tower factor etc. considered for the program.

xvii. If the bidder fails to meet the performance parameters/ chemical residuals and recommends for increase in blow down rate, equivalent additional chemical quantities to keep the optimum conc. of the treatment residuals shall be dosed. The supplier shall dose the same at his cost.

xviii. The treatment shall be designed on 8.0 COC (yearly average). However, if the bidder fails to maintain the desired treatment chemical residuals at 7 - 9 COC, vendor shall bear the cost of additional quantity of chemicals required to maintain the minimum treatment residuals in the CW System. The bidder needs to consider the RO make up from the ETP – RO Plant.

xix. The Chemical supplied shall not have any deleterious effect on any component of the CW system including the packing materials of cooling towers.

xx. Bidder shall indicate clearly the constituents and active components of the chemical / Formulation used for the treatment. If required, they shall also provide all analytical methods to analyze the residual levels of the treatment chemicals and same to analyzed in MPL Lab (necessary reagents provided by vendor) or its active ingredients in the system and control measures for the correct dosage of the chemicals.

xxi. Bidder shall make arrangements for complete Microbiological analysis on site on monthly basis by the method of bactaslides & portable type microbiological test kits.

xxii. Vendor shall do water audit of our plant once in a year. Vendor shall conduct Technical training session at every quarter at MPL.

xxiii. Vendor shall submit overhauling report related to CW system (CT fills, CT basin, condenser & PHE inspection) during AOH and do deposit sample analysis

5.00 PERFORMANCE GUARANTEE REQUIREMENTS

Sr. No	Description	Limiting Value
1	General Corrosion Rate	
	a. On MS	< 2.0 MPY
	b. On SS304	< 0.1 MPY
2	Micro/Bio-fouling conditions	
	a. Total Bacterial Count (TBC)	<1x10000 Colonies/ml.
	b. Sulphate Reducing Bacteria (SRB)	<1x100 Counts/100 ml.
	c. Iron Reducing Bacteria	<100 colonies/ml.
3	Fouling in fill packs of Cooling Tower & Condenser during shutdown and that in the pilot cooling tower fills on monthly basis.	Should be found clean on visible inspection.

4	CT Approach	Should not increase more than 0.5 Deg. C
5	CT Efficiency	Should not deviate more than 10%
6	Scaling Rate of total internal tube surface of Condenser per year.	<10 mg/sq.dm
7	Ca: Mg Cycle Ratio should be greater than 0.5 on daily basis . If any variation will observed immediately informed to MPL Concern person with proper justification	

Note:

(1) For Condenser Vacuum & pressure drop across the Condenser (C.W. Circuit), A stable value (based on the actual operating conditions) for Vacuum, P & CT Approach temperature respectively shall be mutually recorded by the Bidder and MPL prior to or at the time of starting the regular treatment for guaranteed purposes.

2) Corrosion rate shall be ascertained by placing non passivated coupons by the bidder as per ASTM D2688; however, MPL reserves the right to install its own coupons, results of which shall be binding to bidder. The corrosion measurement loop / test rack with locking arrangement shall be supplied by the bidder.

3) The evaluation of the treatment will be done on a) Corrosion coupon testing b) Visual inspection of the cooling tower & condenser during shutdown. c) In case of the failure of the above terms the vendor is bound to increase the dosage at his own cost and meeting the treatment guarantee parameter. No Scaling / fouling of the condenser should be observed during annual inspection of the condenser at the time of annual overhauling.

4) CT Efficiency & Approach to be monitored on regular basis.

5) Penalty Clause:

In the event of performance parameters exceeding the guaranteed limits, the penalty for deviation will be as under for the specific month of deviation observed:

Metallurgy	MS	SS	Penalty
Corrosion rate:	2.0-2.5 MPY	0.1 to 0.2 MPY	25 % of the 1/12 th of the Total annual order value
	2.5-3.0 MPY	0.2 to 0.3MPY	50% of the 1/12 th of the Total annual order value
	> 3.0 MPY	>0.3 MPY	100% of the 1/12 th of the Total annual order value

2. In case the TBC and /or SRB/ or IRB exceeds the performance limits penalty will be 25 % of 1/12th of the order value for the year.

3. In case the scaling in condenser due to failure of chemical treatment penalty will be 25% of the of the order value of the year or termination of the contract with immediate effect as decided by the purchaser.

4. In case the pH of cooling water deviates from the control range Rs. 500 /incident to be deducted from the next bill.

5. In case the declared chemical residuals in cooling water deviate from the control range, Rs.1000 /day to be deducted for each parameter.

6. In case if the COC is lower than the agreed COC due to the bidders, penalty will be 10 % of the monthly order value.

7. For deterioration of CT efficiency, penalty will be 5% of yearly contract value.

8. For deterioration of CT approach, penalty will be 5% of yearly contract value

9. If fills weight gain is more than 10%, Penalty will be 5% of yearly contract value

Since the 2X525 MW. is being operated at higher PLF, wherein plant availability will be a crucial factor so MPL being a TATA organisation would like to have the following value delivery initiative from the vendor:

- Help MPL identify value delivery projects of development and savings enabling MPL save Total Cost of Operation (TCO). Vendor must establish successfully at least ONE such project with proper savings during the contract period, failing to which will attract 0.5% of penalty of the total contract value.
- Performance Review Meeting Once in a Quarter, failing to which will attract 0.5% of penalty of the total contract value.
- Party shall do water audit of our plant once in a year, failing to which will attract 0.5% of penalty of the total contract value.
- Party shall conduct technical training session at every quarter (June, September, December and February) at MPL, failing to which will attract 0.5% of penalty of the total contract value.

8. Penalty clause for improper housekeeping & 5S.

S. No.	Violation	Penalty
1	Housekeeping & 5S	
	Proper housekeeping being not maintained	
	First	Warning
	Second	5% or Rs. 5000.00 per month whichever is minimum
	Third	10% or Rs. 10000.00 per month whichever is minimum

DESIGN ANALYSIS OF CT MAKE-UP WATER (OPERATING C.O.C. 7.0 -9.0).

9. If consecutive three-month deviation in guaranteed parameters as mentioned in clause 5.0, whole cooling water treatment contract may be terminated by MPL.

Note:

- While designing the Cooling Water Treatment program vendor shall take into consideration the seasonal changes in makeup water quality. The bidder needs to consider the RO make up from the ETP – RO Plant.
- Clarified water along with ETP -RO water at present is used for makeup water
- Treatment residuals for Antiscalant / Corrosion Inhibitor/Polymeric dispersant/ Bio dispersant for microbiological control should be maintained as per system requirements to meet all the guaranteed parameters. Vendor to clearly state the designed residuals along with the active component in their technical offer for our evaluation as per below calculation sheet,

PRODUCT DATA SHEET)

Chemical consumption Computation Data sheet to be filled by the Bidder:

SCHEDULE -I

Attributes	Name of the chemicals	Active components	Dosing Rates		Total Quantity	Total Quantity
			Continuous PPM	Residual PPM		
					Kg/day	(for 2X365 days)
Scale Inhibitor (To be dosed regularly on BD)		PBTC (Vendor to specify the active %)	Vendor to specify	0.8 – 1.5 Organic Phosphate as PO4		
Corrosion Inhibitor		Zinc (Vendor to specify the active %)	Vendor to specify	0.4 - 1.0 as Zn		
Polymeric Scale Dispersant (To be dosed regularly on BD)		Vendor to specify the active %	Vendor to specify	2 – 2.5 ppm as active Polymer		
Bio- Dispersant (To be dosed regularly / twice in week)		Vendor to specify the active %	Vendor to specify	1.5 ppm on SV		
Non-Oxidising 1 Biocide (Once/Alt. quarter on SV)		Vendor to specify the active %	20 ppm on System Volume			
Non-Oxidising 2 Biocide (Once/Alt. quarter on SV)		Vendor to specify the active %	20 ppm on System Volume			
CT Fills Conditioner (To be dosed regularly on BD on every quarterly basis) Objective: Fills to be clean with any foulant		Vendor to specify the active %	Vendor to specify	Vendor to specify Objective should be followed		
Sulphuric Acid		98%				
Liquid Chlorine		100%				
Other's if any						

Note:

1) Residual mg/l = % active content x ppm dosage

Date: 30.11.2023

The above recommendation is for COC – 8.0 (yearly average) However, the CW system will be operated @7 to 9 COC or more. Need to consider Ca & Mg COC also along with Chlorides COC.

- 2) Initial Fill of chemicals to be considered. Details of calculations to be provided.
- 3) MPL's decision & consideration will be final and all vendors have to abide the decisions.
- 4) Consumption of Sulphuric acid and Chlorine to be declared by vendor during bidding process. Extra quantity will be provided by vendor free of cost.
- 5) Automated daily report to be submitted by Vendor.
- 6) Vendor shall assured that our data is protected and also mention that which IS Standard they are following equivalent to IS 27001.

Date: 30.11.2023

