



SCOPE OF WORK

Name of the work: Condenser Cooling Water Treatment at Ib Thermal Power Station.

01. SYSTEM DETAILS:

The Condenser Cooling Water system is an open re-circulating type system meant for condenser cooling purpose of two nos. of surface condensers.

The system consists of:

Cooling Tower-	2 Nos. (Induced Draft Type), 01/Unit
No of shells/Tower-	24 (22W+2S)
Hold up Volume	200000 m ³ (For both Units),
Re-circulation rate/Unit-	80000 M ³ /hr/Unit
Structure of cooling tower-	RCC
ΔT across the cooling Tower-	9.7 ⁰ C
CW inlet temp	42.5 ⁰ C
CW outlet temp	32.8 ⁰ C
COC to be maintain	5.5-6.0

Note: - side stream filter (Auto Valve less Gravity Filter) is available in the system @ 2% (1632 M³/Hr/Unit) of Re circulation Rate. The blow down provision is from condenser return line.

Make Up Water Parameters:

	Make up Water (Raw Water) (Source-Hirakud Reservoir)
pH	7.5 to 8.5
Conductivity micro Simens/cm	120 – 200
Turbidity NTU	<10
P-alk (mg/L CaCO ₃)	Nil to 5
M-alk (mg/L CaCO ₃)	50 to 90
Chloride (as Cl ⁻)	10 to 20
Tot. H (mg/L CaCO ₃)	50 to 90
CaH (mg/L CaCO ₃)	35 to 65
Mg H(mg/L CaCO ₃)	15 to 25
Silica as SiO ₂ (Mg/L)	6-12
Iron as Fe (Mg/L)	<0.3

Water quality Variations: The bidder has to consider the occasional deterioration of make-up water quality and to adjust the requisite chemical dosing rate without any extra cost impact. The bidder, if want, can collect make up Water Sample for analysis at their end to finalize the chemicals & doses required for the system. The water parameters mentioned in the above table are only an indicative one.

System metallurgy-

- a. The condenser tube metallurgy is SS 304,
- b. Pipe lines, Condenser Box etc. are MS.

02. TREATMENT SYSTEM AVAILABILITY

- a. Antiscalant, Biocide, corrosion inhibitor, sulphuric acid dosing system is available with us. Party has to use our dosing system. In case of unavailability of the existing dosing system, party has to arrange alternate dosing pumps available till our system normalization for an uninterrupted treatment.
- b. Chlorination system @ 120 Kg/hr is available with us, which shall be run in General shift only for 4-5 hours only on working days.
- c. Sulphuric acid dosing system is available with us. Sulphuric acid handling in from measuring tank shall be operated by bidder using all safety precautions.

All the treatment chemicals must be ecofriendly and must meet the stipulated norms of State/Central pollution control board against which relevant certificate shall have to be produced by the party at the time of tender submission. MSDS of all the products shall have to be submitted at the time of product supply for safe handling of the chemicals.

03. KEY PERFORMANCE INDICATORS:**3.1 Scaling / deposition Parameter:**

Physical Inspection of Condenser and PHEs shall be carried out whenever required for monitoring the performance of treatment. No Scaling/Corrosion/Bio fouling must be found during Inspection,

3.2 Microbiological Parameter:

- i. Total Microbiological count: Below 10^5 colonies per ml.
- ii. CW System should be free from algae/ biological fouling & fungi.
- iii. Sulphate reducing bacteria: Less than 100 Counts/ 100 ml
- iv. Iron Bacterial Growth: Null

3.3 Corrosion Rate:

Corrosion rate for MS should be less than 2 MPY and 0.1 MPY is that of for SS without pitting.

3.4 Heat exchangers and pipelines shall be considered for physical examination whenever required. During inspection, indications of scale, fouling and corrosion over and above the initial condition (Before startup of treatment Program) should not be present.

3.5 Differential temperature and pressure, TTD, LMTD of heat exchangers and condenser should remain same that of the initial value (Before startup of treatment Program) during the treatment period.

3.6 Selected Fills weight shall be weighed before starting of the treatment and afterward every month fills weight profile shall be checked in every unit. The tolerance limit shall be maximum 2%.

3.7 Blow down water quality parameter should meet all the stipulations & conditions of state and central pollution control board.

04. CHEMICAL CONCENTRATION:

4.1 The party shall have to mention product composition and average product concentration for evaluation of product quality at our lab on arrival of chemical lot. Party has to submit the test procedure for the constituent concentration analysis. Joint analysis shall be done at OPGC lab for confirmation of product concentration.

4.2 Party shall submit third party (from NABL lab) Test certificate clearly indicating the constituents of the chemical formulation used for the treatment with every lot of chemicals.

4.3 Party shall provide the residual levels of the treatment chemicals to be maintained in circulating cooling water. Inhibition effect of the formulation w.r.t CaCO₃, CaSO₄, MgCO₃, MgSO₄ & CaPO₄ will also be tested at site by the contractor along with the testing procedure.

05. TREATMENT SCOPE

Sl.No.	ITPS SCOPE	CONTRACTOR SCOPE
1.	OPGC will provide Chlorine tonners for dosing in CW Water.	a. Chlorine shall be dosed for 05 to 06 hours every day @ 100-120 Kg/Hr. (Except Sunday and OPGC declared holidays)
2.	OPGC will provide Sulfuric Acid to maintain pH.	a. Sulfuric acid shall be dosed in CW water to maintain the pH within the range of 8.4 to 8.6. b. Party has to give average monthly guaranteed sulphuric acid consumption. If more sulphuric acid is consumed over the guaranteed consumption, party has to bear the additional cost.
3.	Treatment Chemical Storage Space shall be provided by ITPS.	a. Treatment Chemicals and Empty carboys handling in OPGC Premises shall be in contractor's scope only.

06. MONITORING TECHNIQUE

The monitoring shall be conducted with most appropriate and modern technique.

Minimum Equipments to be deployed by bidder to check the performance parameters on round the clock basis:

- a. Portable pH Meter, Conductivity meter, ORP Meter, Colorimeter etc.
- b. Corrosion racks, and sufficient corrosion coupons for every Unit as per IS 8188 latest revisions.
- c. Equipments suitable for measurement of TVC and SRB.

- d. Sufficient number of Dosing pumps in case of dosing system unavailability.
- e. Bio Fouling Monitor for every unit
- f. Deposit monitor for every unit
- g. Chemical parameters Analysis Frequency: -
 - pH, Conductivity, Turbidity, TDS, Hardness, SO_4^{2-} , Cl^- , L.S.I., R.I., Ratio Difference of Ca & Mg ratio of C.W. water & Make up water must be <0.1 at any circumstances, Cu, Iron, Zn, Total Phosphate, Inorganic Phosphate, R-Cl_2 , Product Level: Once a day
 - pH, Conductivity, TDS, Hardness, Cl^- , R-Cl_2 : Once a Shift
 - BOD, COD and Other Microbiological analysis: Every three months at contractor lab
 - Oxidation value (KMnO_4 Value) in MW and CW: Every week
 - Process Parameters- Vacuum, ΔP , ΔT , TTD, LMTD, Condenser fouling factor, Wet bulb and dry bulb temperature, humidity, Heat Flux, Heat Transfer co-efficient, CW flow, No of CT fan in operation, No of CW pump in operation, MW generation etc. : On daily basis
 - Microbiological testing- TVC, SRB, Iron Bacteria : once in every 15 days.
 - Lab. facility Space for water parameter testing will be provided by OPGC, however in case for any test, suitable facility cannot be done at in ITPS site, the party has to provide the facility for these testing.
 - Daily, weekly, monthly report on the performance of the treatment program along with the analysis report, chemical consumption pattern and availability and observations shall be given by party for review to EIC.

Note: All the above said equipments and reagents required for analysis should be calibrated and defined calibration frequency shall be followed. The calibration certificates shall be submitted to owner. Chemicals/ Reagents/Consumable required for above scope of work shall be in contractor scope.

07. CHEMICAL SUPPLY SCHEDULE

The party has to supply the chemical on FOR destination basis. The chemicals are to be supplied to our central store/site in 3 phases. Each phase chemical quantity shall meet 4-month treatment program. The party should report the daily status at the end of each day to the Engineer In-Charge or his authorized representative & monthly compiled reports are to be submitted latest by 7th of the next month, if consecutive 2 month treatment will found satisfactory, the party will be given clearance to supply the next phase chemicals just one and half month before the 1st phase treatment is over. The party has to mobilize the chemicals at the ITPS site with all necessary documents positively within seven days before the chemical exhaustion date to avoid any possibility of discontinuity.

08. TREATMENT/MONITORING WORK & RESPONSIBILITY:

The contractor shall engage requisite nos. of technical persons for quality of performance.

Minimum Man power requirement to monitor the treatment effectiveness shall be as below:

- a. Site In-charge: 1 No./Day (Min Exp. 2-3 years in the field with min. B.Sc. Qualification)
- b. Chemist cum Operator: 1 No/Shift to monitor shift basis (365 Days basis) operation of Sulphuric acid/ CW treatment chemicals/Chlorination System. (Min Exp. 1-2 years in the field with min. B.Sc. Qualification)
- c. Helpers: Requisite number of helpers to meet given scope of work.

Note: Above manpower requirement is minimum and indicative, contractor can deploy more manpower based of work efficacy. The expert guidance and support service is to be given by the party as and when required & on every month interval for betterment of the treatment process.

All chemical analysis, process parameter record and all jobs related to the treatment to be monitored by the party's personnel.

09. EXCESS DOSING

The treatment will be conducted on their fixed recommended dosage, which is guaranteed. Any excess quantity found necessary to be dosed in excess of the above recommended dosage level shall be supplied free of cost.

10. TEST CERTIFICATE:

The phase wise chemical supply must be accompanied with the detail test certificate of the individual chemicals, which should represent the whole consignment.

11. SIZE OF PACKING AND HANDLING

The chemicals shall be supplied in sealed and portable carbouys. Unloading of full carbouys & loading of empty carbouys at ITPS site will be in contractor’s account. The party has to return back the empty jerry cans after each batch of treatment is over at his cost & conveyance. The party will submit a written declaration that the empty jerry cans shall be disposed in an eco friendly manner. OPGC shall not be held responsible in the event of any accident during the disposal of these empty Jerry Cans.

12. CHANGE OVER TO NEW TREATMENT

Vender can change over from the existing treatment to new treatment program in between the contract period for betterment of system. Vendor to justify clearly at the time of changeover of treatment program, the extra cost impact shall be borne by the vendor only for the rest of the duration of the contract.

13. SAFETY

Contractor shall have to follow the OPGC safety norms violence of safety norms may lead to termination of the contract.

01. PENALTY CLAUSES:

Following will be penalties, in case any of the performance indicator goes out of range-

S.No.	Parameters	Penalty
1	TVC and SRB count	1 % of the total contract value shall be deducted per instance.
2	Deposition in Condenser	2 % of the total contract value shall be deducted or Cost for cleaning the condenser shall be borne by supplier, whichever is higher. Based on Physical inspection.
3	Deposit in PHE	1% of the total contract value shall be deducted per instance, Based on Physical inspection
4	Corrosion rate	1% of the total contract value shall be deducted per instance
5	Absence of minimum manpower	1% of the monthly contract value shall be deducted per instance. Shall be calculated on monthly basis.
6	Bio fouling	On the basis of visual inspection of cooling tower and/or bio fouling monitor reading, 1% of the total contract value shall be deducted per instance.
7	Fills weight	1% of the total contract value shall be deducted per instance
8	Non Fulfillment of Delivery schedule of Chemicals	1% of contract value per instant

9	Safety Violation	In Case of any violence of ITPS Safety norms eg. unsafe act found by contractor's staff, a penalty of Rs 5000 shall be recovered from preceding month's bill per instance.
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