Bharat Heavy Electricals Limited

High Pressure Boiler Plant
Tiruchirappalli – 620 014. India
Civil Engineering Department (Factory)

TENDER DOCUMENT (PRICE BID)

Name of work	**:**	**Operation and Maintenance of Producer Gas Effluent Treatment Plant including laboratory analysis in BHEL, Tiruchirappalli-14.**
Value of work	**:**	**Rs.27.15 Lakh**
Tender Notice No.	**:**	**02/11-12**
Tender Schedule No.	**:**	**10/11-12**
Period of Contract	**:**	**15 (Fifteen) Months**
Issued to M/s / S/Shri	**:**	

SCHEDULE 'A'

LIST OF WORKS AND PRICES

DETAILS & QUANTITIES of each item of work shown in the BILL OF QUANTITIES are only approximate. They are given as a guide for the purpose of tendering only and are liable to variation and alteration of the Competent Authority. The work under each item as executed shall be measured and priced at the corresponding rate quoted by the contractor in the BILL OF QUANTITIES

Sl.No.	Description of work / supplied	Total amount of work / supplies (in figures and words) Rs. Ps.	Period of contract
1.	Operation and Maintenance of Producer Gas Effluent Treatment Plant including laboratory analysis in BHEL, Tiruchy.	Rs. 27,15,000/- (Rupees twenty seven lakh and fifteen thousand only)	Fifteen (15) months

BILL OF QUANTITIES

Sl.No.	Appx.Qty.	Description of work	TNBP No.	Rate (Both in Unit fig & Words	Amount Rs. Ps.

AS PER SEPARATE SHEETS ATTACHED CONTAINING **11** PAGES

FROM SERIAL No……**3**……to……**13**……..

BHARAT HEAVY ELECTRICALS LIMITED
TIRUCHIRAPPALLI – 14

BILL OF QUANTITIES

NAME OF WORK: Operation and Maintenance of Producer Gas Effluent Treatment Plant including laboratory analysis in BHEL, Tiruchirappalli-14.

Sl. No.	Quantity	Description of work	Rate (both in figures and in words)	Unit	Total Rs. P.
1.	15 Months	Operation and Maintenance of existing Effluent Treatment Plant at BHEL, Trichy-14 located between Factory Oxidation Ponds near Pudu theru and R S K Nagar. The scope of work covers Operation of the Gas Plant Effluent Treatment Plant for three shifts in a day, as convenient to BHEL and on all the days including Holidays and Sundays in a year including Operation and maintenance of all equipments like pumps, motors, Compressor, Dissolved Air Floatation (DAF), Aerators, flash mixing units, DG set and Diesel Engines in case of power shut downs, Dosing of chemicals like alum, polymer, nutrients like DAP, Urea, fuels like diesel, lube oils, etc., regular cleaning of all chambers, tanks, drying beds and clearing away all debris in and around the plant, hazardous waste (dried DAF scum) packing and storing in identified area, disposing the treated water which should be non-toxic and as prescribed by standards to the area identified for Horticulture/ Plantations as directed by the Engineer-in-charge, trouble shooting of abnormal situation like process, mechanical and electrical failures, checking of leakages in the pipelines including periodical preventive maintenance, replacement of spares supplied by BHEL as and when required for safe running of equipments, flow measurements of influent and		Month	

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Sl. No.	Quantity	Description of work	Rate (both in figures and in words)	Unit	Total Rs. P.

effluent of the plant if necessary, testing and analysis of influent and effluent samples of ETP, etc in the Lab located in the Plant premises, maintaining records for all operations, usage of consumables like, chemicals, fuel, power etc.

The scope also includes co-ordination with statutory bodies like TNPCB / CPCB and others as and when required for collecting samples, analysis, etc., up keeping of the premises neat and tidy. Required treatment and laboratory chemicals, nutrients, fuels, spares for the plant and lab will be supplied by BHEL at ETP. The existing Lab facility can be availed. The scope of work includes labour charges for all Lab Chemist, Operators, Technicians, electricians, and skilled and unskilled labourers. Special Conditions of Contract, Man power Requirement, detailed List of Activities, details of pumps and equipments available in ETP, facilities in lab, Gas Plant ETP flow chart are given in the Annexure.

NOTE:

During this period the contractor should take whole responsibility of Plant operation including treatment efficiency. Any deviation from the specific performance requirement of any equipment or quality of treated effluent as per norms, the contractor shall immediately take steps to rectify the deficiency without any extra cost to the Authority.

SPECIAL NOTES:

1 The Operation and maintenance is to be carried out in Three shifts a day for all the activities as listed in Annexure-I and maintaining pumps, DG sets, Diesel Pumping engine, Power tiller, etc., as listed in Annexure-IV.

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Sl. No.	Quantity	Description of work	Rate (both in figures and in words)	Unit	Total Rs. P.

2 The contractor should engage supervisors, operators, technicians skilled and unskilled workers and lab Chemist. The man power requirment shall be as given below (Ref ;Annexure - III of the Price bid.

a Chemist- 1 No/ day.(in General shift)

b Supervisor -1 No. for each shift - A, B & C (i.e. 3 x 1= 3 Nos./ day)

c Technician/ Operator/Mechanic- 1 No. for each shift - A, B & C (i.e. 3 x1= 3 Nos./ day)

d Electrician - 1 No. for each shift - A, B & C (i.e. 3 x 1= 3 Nos./ day)

e Unskilled Workers- 3 Nos. for each shift (i.e. 3 x 3 = 9 Nos. / day)

3 Deduction will be made on pro rata basis as per the approved and awarded rate in S.lNo.1 / month for any shift that is not operated for any reasons.

4 The labourers shall be paid additional payment as mentioned below in addition to the payment of minimum wages, Bonus to the workmen employed by him at the rates which shall not be less than the minimum wages applicable from time to time .(Un Skilled Worker - Rs. 2000/ Pm, Semi Skilled Worker Rs. 2300/pm & Skilled worker Rs. 2500/pm.)

TOTAL .. .. ..

(RUPEES …… **ONLY)**

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SPECIAL CONDITIONS OF CONTRACT

01 The existing Plant is capable of treating 500 cum of effluent per day. List of activities on daily basis and the process layout with characteristics of influent and effluent is enclosed in Annexure I & II respectively.

02 The contractor should engage Supervisors, Operators, Technicians, skilled and Unskilled workers and lab Chemist. The Man power requirement is given in Annexure- III for operation & treating the effluent generated from Producer Gas plant to the norms specified by BHEL and dispose the treated water as directed by the Engineer-in-charge. The labourers engaged should be paid not less than the prevailing minimum wages as per State Government norms.

03 Operation and Maintenance is to be carried out in Three shifts a day for all the activities as listed in Annexure – I and maintaining pumps, DG set, Diesel pumping engine, power tiller, etc as listed in the Annexure – IV.

04 Deduction will be made on pro rata basis as per the approved and awarded rate in Sl.No.1 per month for any shift that is not operated for any reasons other than on BHEL account.

05 **The work is to be executed on all BHEL working days including public holidays and Sundays.**

06 If the system is not operated for more than a shift of 8 hours due to break-down on account of other than Power Supply, non availability of effluent, Spares, etc., recovery will be made on pro rata basis as per the approved and awarded rate as in Sl.No.1 per month from the date of break down to the date of putting back the system to perform effectively.

07 Required Power and water for the Operation of the system will be provided by BHEL free of charges.

08 Required Consumables like alum, Polymer, Urea, DAP, fuels like diesel, lube oils, etc. will be supplied by BHEL at stores.

9 **Raw and treated water should be tested for pH, TSS, TDS, Phenolic compounds, COD, BOD @20 º C for 5 days / 27º C for 3 days, Oil & Grease, etc as per the schedule given in the Annexure -V and raw effluent from P G Plant shall be tested once in a month and a record should be maintained and produced to BHEL for its verification. Analysis should be conducted in the lab located at ETP premises with all necessary equipment for conducting the above said tests.**

10 The contract should maintain all monitoring records w.r.t ETP operation and maintenance, Laboratory analysis, etc as listed in the Annexure – VI

11 The Contractor should associate for collecting samples by Statutory bodies like Central Pollution Control Board, Tamil Nadu Pollution Control Board and others if necessary.

12 The contractor shall ensure payment of Minimum wages, Bonus to the workmen employed by him at the rate at which shall not less than the minimum wage applicable under Law from time to time.

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13 PF & ESI Act should cover the workmen as applicable and payment will be made only on verification of the documents for the remittance of ESI and PF for the personnel engaged in the work.

14 The tar collected from tar oil separator of ETP is to be disposed to Producer Gas plant inside factory. Necessary empty barrels can be taken from them and filled tar barrels handed over back to P G Plant and get the acknowledgement for the qty.issued.

15 One Power tiller will be provided by BHEL free of hire charges for disposal of tar barrels to producer gas plant, receiving materials from BHEL stores, movement of hazardous waste (Dried DAF scum) to storage area, etc as and when required

16 The sludge collected from DAF scum drying bed shall be packed in polythene bags and kept inside the Hazardous wastage shed. Records should be maintained for the quantity generated and stored on monthly basis.

17 The contractor should submit the list and quantity of consumables and spares used every month for the verification by BHEL.

18 The spares required for all pumps and the equipments shall be given by the contractor well in advance so as to procure and keep ready to run the plant without any interruption, and the same will be issued to them on written requisition. Replacing of defective spares is in the scope of contractor. Records shall be maintained for the receipt and use of spares supplied by BHEL.

19 **The workers should be provided with personal protective equipments such as Gloves, Goggles, safety shoes, waste cloths, soaps, etc by the Contractor.**

20 **The contractor should follow all procedures pertaining to safety and EMS in day to day running of the plant.**

21 **The contractor should keep a First Aid Box with list of Aids and should be refilled as and when required.**

22 **During this period the contractor should take whole responsibility of Plant operation including treatment efficiency. Any deviation from the specific performance requirement of any equipment or quality of treated effluent as per norms, the contractor shall immediately take steps to rectify the deficiency without any extra cost to the Authority.**

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Annexure - I

DETAILED LIST OF ACTIVITIES
(Ref: Sketch in Annexure – II)

S.No		ACTIVITY
1	**Operation Of Effluent Pumps** (List of Pumps & equipments as listed in **Annexure-IV**)	
	A	Pump the PG plant effluent to Tar Oil separator by operating 10HP/3HP Pumps
	B	Pump sewage to Aerators by switching on 5 HP Pump
	C	Note down the initial and final readings of the flow meter in each shift.
2	**Operation Of Dissolved Air Floatation (DAF)**	
	A	Keep 95 kg of Alum (600 ppm, 10% solution) in 1000 litres of water. Mix it in Alum dosing tank with Compressed Air
	B	Keep 0.48 kg of Polymer (3ppm, 0.05 % solution) in 1000 litres of water. Mix the chemicals with Compressed Air in polymer tank
	C	Start Feed pump and Chemical dosing pump.
	D	Start High Pressure pump. Open the valves and adjust the pressure of Air Dissolved Tube to 4 kg/cm^2. Keep Air flow into Air dissolved tube) ADT at 2 – 2.5 NM^3/Hr.
	E	Adjust the pressure gauges (2 Nos.) of dissolved air inlet to the super cell at 4 kg/cm^2
	F	Start the variable speed gear motor for scooping the floating scum from the cell.
	G	Collect the scum in scum drying beds. Pump the filtrate to the Aeration tanks.
	H	Collect, pack and store the dried scum in polythene bags at Hazardous waste storage shed
	I	Adjust the Alum dosing so as to get clear water from outlet of DAF system
	J	Frequently check all the pressure gauges and scum removal line
		<u>Shutting of DAF unit</u>
	K	Switch off High-Pressure pump, feed pump, Chemical dosing pump, compressor, and variable speed gear motor. Close the pressure gauges valves.
	L	Close the valves of Alum and Polymer tanks
	M	Close inlet valve of High pressure pump and cut off compressed air to ADT

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S.No	ACTIVITY	
3	**Operation of Aerators**	
	A	Ensure continuous running of all the four aerators and sewage pump of 5HP.
	B	Start the Clarified water storage tank pump and check the quantity of sewage inflow to the Aeration tanks. (1 part of effluent and 3 parts of sewage)
	C	Allow both sewage and clarified effluent to the Aeration tanks.
	D	Switch on the Sludge return Pump for a period of 8 (eight) hours in order to maintain required MLSS (1500 - 3000 mg/l) in the Aeration tanks. Check the Dissolved oxygen in all the four aeration tanks on daily basis.
	E	Keep 1 (one) kg of DAP and 1 (one) kg of urea each in all the tanks once in a day to maintain the ratio of nutrients to the organic load.
	F	Note down the pumping hours of the clarified water pump (3 HP)
4	**Chemical dosing after secondary clarifier.**	
	A	Add 10 kg of Alum (25 ppm, 0.75 % of solution for a flow of 500 cum / day.) and 0.30 kg of Polymer (1ppm, 0.003% of dilution for 300 cum / day of flow.) in the Alum and polymer tanks.
	B	Open the valves of Chemical dosing tanks. Run the flash mixer for mixing the Chemicals with clarified water.
	C	**Check the colour and pH of the water after tertiary clarifier frequently and adjust the chemical dosing accordingly.**
	D	**Pump the settled sludge from the tertiary clarifier to one of sludge drying beds.**
	E	**Collect the dried sludge from the sludge drying beds and dispose it in the area identified by the Engineer incharge.**
	F	**The supernatant from the tertiary clarifier is pumped to sand filters for filtering the effluent before disposal.**
	G	**Pump the filtrate from the final disposal sump to Horticulture purposes.**
	H	**Note down the initial and final reading of the flow meter in each shift provided at the final outlet point.**
5	**Maintenance of Pumps, Aerators, etc.,**	
	A	Periodically tighten the foundation bolts of the pumps
	B	Check the glands ropes of pumps for leakage
	C	Prime the pumps if necessary
	D	Check the foot valves of the pumps for clogging
	E	Check the Oil level in the gear box of Aerators, Flash mixer, etc
	F	Look for irregular sounds when the aerators are working. Take necessary action to arrest the vibrations

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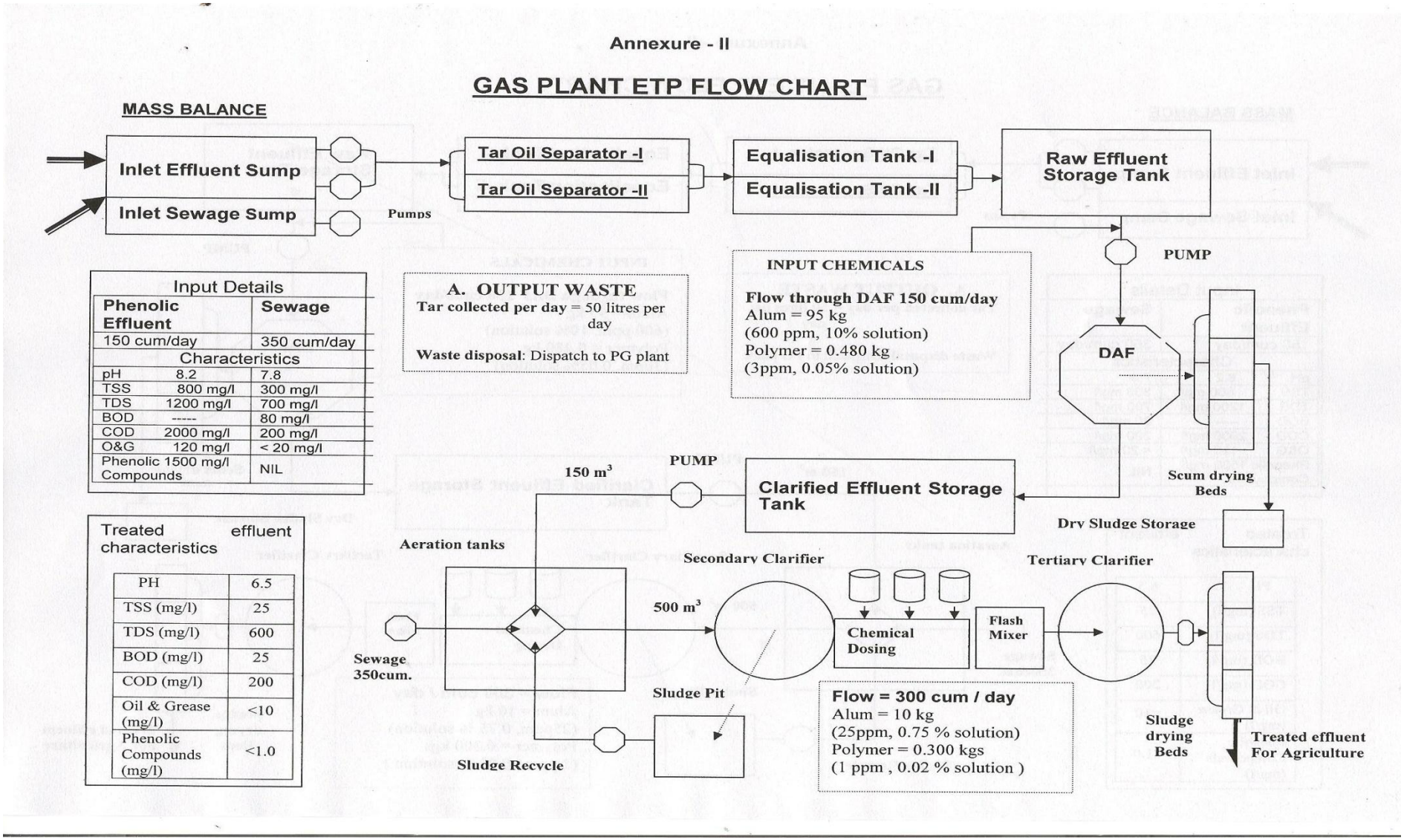
Annexure - II

GAS PLANT ETP FLOW CHART



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Annexure - III

MAN POWER REQUIREMENT

Sl. No.	DESCRIPTION	Edu. Qualifn	Nos. Reqd.	Shift(s)	Total Nos./ day	Remarks
1	Chemist	M.Sc.	1	General	1	Only on working days of BHEL,TRICHY **excluding Sundays and Holidays.**
2	Supervisor	Diploma	1 For each shift	A B & C	3	All the days **including Sundays and Holidays** round the year.
3	Technician/Operator/ Mechanic	ITI	1 For each shift	A B & C	3	
4	Electrician	ITI Electrn.	1 For each shift	A B & C	3	
5	Unskilled workers	----	3 For each shift	A B & C	9	
	TOTAL NO.OF LABOURERS / DAY				19	

SHIFT DETAILS:

- **General Shift - 8.00 to 16.30 Hrs**
- **'A' Shift - 6.00 to 14.00 Hrs**
- **'B' Shift - 14.00 to 22.00 Hrs**
- **'C' Shift - 22.00 to 6.00 Hrs**

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Annexure – IV

DETAILS OF PUMPS AND EQUIPMENTS

SL No.	LOCATION	PUMP DETAILS					REMARKS
		MAKE	HP	KW	RPM	QTY	
A. INLET PUMPS							
01	Sewage Inlet Pump	Kishor	3.5	2.6	2900	1	Submersible grinder pump
02	Effluent inlet pump -1	Suguna	10	7.5	1440	1	
03	Effluent inlet Pump-2	Suguna	3	2.2	2880	1	3ph induction motor
B. DAF SYSTEM							
01	DAF inlet motor	ABB	5.0	3.7	2830	1	
02	DAF inlet motor	Suguna	5.0	3.7	2880	1	Stand by
03	Chemical Dosing Pump	ABB	0.5	0.37	1370	1	
04	High Pressure Pump	ABB	10	7.5	2850	1	3 Ø squirrel cage induction motor
05	DAF Scooper motor	Crompton	0.75	0.55	1395	1	
C. AERATORS							
01	Clarified water storage tank motor	Kirloskar	3.0	2.2	2830	1	
02	Surface Aerator – I (Fixed type)	Kirloskar	5.0	3.7	1430	1	3ph induction motor
03	Surface Aerator –2 (Fixed type)	ABB	5.0	3.7	1425	1	3 θ squirrel cage induction motor
04	Surface Aerator – 3 (Fixed type)	Kirloskar	5.0	3.7	1430	1	3ph induction motor
05	Surface Aerator – 4 (Fixed type)	ABB	5.0	3.7	1425	1	3 θ squirrel cage induction motor
06	Sludge recycling pump	Kirloskar	3	2.2	2800	1	
D. SECONDARY CHEMICAL DOSING							
01	Stirrer Motor-1 (Alum)	Bharat Bijilee	3.0	2.2	1430	1	
02	Stirrer Motor-2 (Alum)	Bharat Bijilee	3.0	2.2	1430	1	
03	Stirrer Motor-3 (Polymer)	Bharat Bijilee	3.0	2.2	1430	1	
04	Flash mixer motor	Bharat Bijilee	3.0	2.2	1430	1	
E.TERTIARY CLARIFIER							
01	Tertiary Clarifier motor	Texmo	5	3.7	1440	1	3ph induction motor
02	Tertiary Clarifier motor	Suguna	3	2.2	2880	1	Stand by
F. DISPOSAL SUMP							
01	Treated water outlet Pump to collection well	Kirloskar	5.0	3.7	1430	1	3ph induction motor
02	Treated water outlet Pump to collection well	Suguna	5.0	3.7	2880	1	Stand by
03	Collection Well Pump	Kirloskar	10	7.5	1450	1	3ph induction motor
G. OTHERS							
01	Diesel Generator	Kirloskar	40KVA	-	1		
02	Motor for TOS Drive	VEM	3.5	2.6	-	1	

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Annexure – V

Sampling and analysis

S. No.	Parameter	Periodicity
A.) Producer gas plant ETP		
1	PH	Weekly once for both influent and effluent
2	Total suspended solids	
3	Total dissolved solids	
4	Oil & Grease	
5	Chemical oxygen demand	
6	Phenolic compounds	
7	BOD_5@20^{O}C or BOD_3@27^{O}C	Once in 10 days – both influent and effluent
8	Mixed liquor suspended solids	Once in 10 days – All four aeration tanks
9	Dissolved oxygen content	

Annexure - VI

List of records to be maintained

1. Consumption of chemicals like alum, Polymer, Nutrients (DAP & Urea), etc on daily basis.
2. Hours of Operation of all pumps, Aerators, DAF, etc.
3. Flow meter reading of Inlet (3HP/10HP) and outlet (5HP) pumps of
4. Hours of operation of DG set during power failure
5. Consumption of Diesel, kerosene, lubricants, etc.
6. Electrical units consumption in each shift
7. Breakdown and corrective/preventive actions
8. Process failures and corrective/preventive actions
9. Collection of tar in ETP and in carriage system from Producer gas plant to ETP
10. Lab monitoring records for all parameters
11. Records for receipt and use of spares, lab chemicals, etc.
12. Hazardous waste (DAF dried scum) generation and storage records
13. Pay aquittance and attendance register
14. EPF , ESI, Sales Tax, Service Tax and Pan No.

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