

## SPECIAL CONDITION (STP OF 50KLD CAP)

- 1] The contractor will submit the design and detailed drawing and detailed specification for the entire STPs 50KLD & ETP 3KLD along with the civil work required for approval of Railway.
- 2] The scope of the work should be included all electric work from inlet to final discharge point for purified water.
- 3] Contractor should quote single rate for each schedule.
- 4] Contractor will have to arrange his own cement and steel as per Railways specification and necessary test certificate from the supplier is to be submitted for the cement and steel to be used on the work.

**OBJECTIVE** – Central Railway at Solapur in experiencing acute water shortage. The water requirement of the Railways for non-drinking purposes such as Apron washing, Gardening & irrigation etc. can be met through treatment and recycling of the waste water otherwise flowing through drain.

### 1.0 THE SALIENT FEATURES OF STP PLANT SHOULD BE - As below

- ❖ The system is based on advanced **CHNR (Continuous Hybrid Nutrient Removal) technology** suitable for effective treatment of hospital wastewater and designed to meet the treated water quality standards as per **MPCB/CPCB norms**. The system shall be compact, modular, prefabricated and odor-free ensuring efficient performance, ease of installation and reliable operation for installation and commissioning of the 50 KLD STP along with the 3 KLD ETP based on CHNR technology.
- ❖ Compact and modular design requiring minimum land area and suitable for space-constrained locations.
- ❖ CHNR Technology based STP shall provide efficient treatment of sewage with consistent outlet parameters meeting applicable CPCB/MPCB norms for discharge/reuse purposes.
- ❖ The plant shall be odor-free, low-noise, and aesthetically suitable for installation near residential/commercial areas.
- ❖ The system shall be based on advanced biological treatment with integrated aeration and clarification process for effective reduction of BOD, COD, TSS, oil & grease, and pathogens. The STP shall be fully automatic/semi-automatic with PLC-based control panel and minimum operator intervention.
- ❖ The treated water shall be suitable for reuse applications such as gardening, toilet flushing, cooling tower makeup, washing, and other non-potable purposes after tertiary treatment.
- ❖ The treated effluent quality shall generally achieve the following parameters as per applicable MPCB norms:

S.N.	Parameter	MPCB Standard
1	PH	6.5 – 9.0
2	BOD (Biochemical Oxygen Demand) [3Days at 27°C]	≤ 30 mg/L
3	COD (Chemical Oxygen Demand)	≤ 250 mg/L
4	Total Suspended Solids (TSS)	≤ 30 mg/L
5	Oil & Grease	≤ 5 mg/L
6	Free Ammonia (as N)	≤ 1.2 mg/L
7	Nitrates	≤ 45 mg/L
8	Dissolved Phosphates (as P)	≤ 5 mg/L
9	Total Coliform	200 MPN/100 ml
10	Bioassay Test on Fish	90% survival after 96 hours



- ❖ The STP shall be provided with tertiary treatment units such as Pressure Sand Filter, Activated Carbon Filter, and disinfection system (UV/Chlorination) wherever required.
- ❖ The technology shall be suitable for railway stations, residential colonies, hospitals, institutional buildings, commercial complexes, and other infrastructure projects.

## **2.0 ADVANTAGES COMPARED TO CONVENTIONAL BIOLOGICAL PROCESSES:**

In general, the main advantages shown by the CHNR process compared to conventional biological processes are:

A reduction in the volume of the biological reactor because of it uses a support or carrier that gives a high specific surface.

It does not require reactor biomass recirculation – This gives rise to the fact that the biomass does not depend on the final separation of the sludge and as a consequence typical problems found in conventional activated sludge processes related to the sedimentation properties of the sludge (filamentous bulking, etc.).

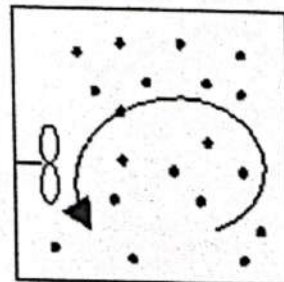
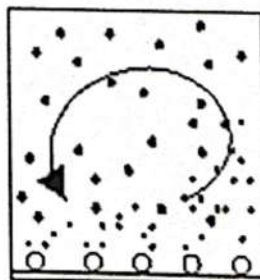
The operation and control is simple for this type of processes. - On the one hand the process avoids blockage problems and consequently regular cleaning periods, in addition it is not necessary to control the sludge purging since the system keeps the biomass in the reactor until it comes off the support.

### **FLUIDIZED AEROBIC BIO REACTOR Process.**

Description of the FAB process

The basic principle of the FAB process is the growth of the biomass on plastic media that move in the biological reactor via agitation generated by aeration systems (aerobic reactors) or by mechanical systems (in anoxic or anaerobic reactors). The supports are made from plastic with a density close to 1 g/cm<sup>3</sup> letting them move easily in the reactor even when the capacity reaches 70%.

The moving bed processes come from the current trend in wastewater treatment, from the use of systems that offer an increased specific surface in the reactor for the growth of the biomass, achieving significant reductions in the biological reactor volume.



*Handwritten signature/initials*



This type of process can be applied both to treatment plants for the biodegradation of organic material as well as for installations with nutrient elimination, in urban and industrial wastewaters. Another application is the use of this technology in the redesign of current activated sludge processes, which only treat organic material, to expand them and include simple nitrogen elimination without the need to construct new biological reactors.

With respect to the aeration system is via a grid of perforated tubes that avoid problems of efficiency loss, diffuser replacement, etc.

The technical & commercial details have been enumerated in the following sections.

## 2.0 Characteristics of the raw sewage water are given below:

Sr. No.	Parameter	Unit	Value Domestic Sewage water
I.	PH	-	6.0 – 8.5
II.	COD	mg/l	300 -350
III.	BOD <sub>3</sub> @ 27°C	mg/l	200 - 250
IV.	TSS	mg/l	200 - 250
V.	TDS	mg/l	600 – 800
VI.	Oil & Grease	Mg/l	10-20

## 3.0 TREATED SEWAGE WATER CHARACTERISTICS

The required characteristics of the treated sewage water as per the company are given below:

Sr. No.	Parameter	Unit	Value
I.	PH	-	6.5 to 9.0
II.	COD	mg/l	≤ 250
III.	BOD <sub>3</sub> @ 27 °C	mg/l	≤ 30
IV.	TSS	mg/l	≤ 30
V.	TDS	mg/l	< 250
VI.	Oil & Grease	Mg/l	≤ 5

### I. END USE OF THE TREATED SEWAGE WATER

The treated Sewage water will be used for the following purposes:

- ✎ Gardening & Tree plantation and other non-potable purpose.

## 4.0 TREATMENT SCHEME

The STP is of modular construction and the treatment process will consist of Four stages.

- ✎ **Stage I : Primary Treatment**  
Screening cum Oil & Grease Trap, Sewage collection Tank,
- ✎ **Stage II : Secondary or biological treatment**



CHNR Reactor, Secondary Tube Settler Tank

≡ **Stage III : Tertiary treatment**

Filter Feed Tank, Pressure Sand Filter, Activated Carbon Filter & Chlorination

≡ **Stage IV : Sludge treatment**

Sludge Drying Beds

**5.0 PROCESS UNITS**

The process units along with their brief purpose to be used for the treatment of Sewage water are given in the following table:

S No.	PROCESS UNIT	BRIEF PURPOSE
I.	Screening cum oil & Grease Trap	For removal of floatable matter like plastic, paper, oil & Grease etc.
II.	Sewage Septic cum Collection Tank	For ensuring continuous and uniform quality feed to the STP system.
III.	Reactor	For biological aerobic treatment
IV.	Blowers & Diffused Aeration System	For supplying air in the aeration tank
V.	Secondary Tube Settler Tank	For separation of bio solids
VI.	Filter Feed Tank	To store the treated effluent for further polishing
VII.	Pressure Sand Filter	For removing the suspended solids, Color & Trace Organic Matter
VIII.	Activated Carbon Filter	For removing the Color & Trace Organic Matter
IX.	Chlorine Dosing System	To kill the Pathogens
X.	Sludge Drying Beds	For dewatering of the sludge through solar evaporation.

**BRIEF PROCESS DESCRIPTION:**

**PRIMARY TREATMENT**

Sewage wastewater will first pass through a screen cum oil & grease trap for removal of floating materials. The overflow of screen chamber will go to the Sewage Collection tank. From there the sewage water will be pumped to inlet chamber for removal of fine particle from sewage water & overflow goes by gravity to grit removal chamber for removal of grit from sewage water. Overflow by gravity flows to inlet of CHNR reactor for Biological Treatment.

**SECONDARY (BIOLOGICAL) TREATMENT**

The CHNR reactor oxidizes the organic matter in effluent to  $\text{CO}_2$  &  $\text{H}_2\text{O}$  by the aeration principle. In CHNR reactor PVC UV stabilized plastic media is provided for the attachment of bacteria and growth. This media has large surface area and High Void age ratio. CHNR reactor tank is fitted with no of air diffusers of suitable capacity to provide necessary dissolved oxygen mixed to the effluent. Twin-Lobe Blowers for oxidation provides the aeration. The biological

*Handwritten signature/initials*



system has to be operated continuously all 24 hours and there by constant feed of Sewage water is required.

The secondary tube settler, which designed on low overflow rate, is provided after the CHNR reactor to enable separation of solids. A steep slope is provided in the secondary settling tank to eliminate the need of scrapper mechanism. A part of the sludge is recalcultated to the CHNR Reactor in order to maintain MLSS levels and a part is drained to the sludge drying beds. Acclimatized Bacterial Culture will be added into the CHNR reactor to give the following advantages as mentioned in the salient points of our offer.

Excess sludge needs to be dewatered and dried for easy disposal. The sludge from the tube settler is collected in sludge collection tank, from here sludge feed to sludge drying beds or centrifuge for dewatering. Dewatered sludge will get dried by the natural heat of the sunlight. Dried Sludge can be used for manure.

The Clarified water collected from the collection launder of the tube settler is then passed to the chlorine contact tank. The treated sewage water will be given dose of chlorine for killing of pathogens (Disinfection)

#### **TERTIARY TREATMENT:**

It is necessary to pass the sewage water further through tertiary treatment comprises of filtration with Pressure Sand filter and Activated Carbon Filter for removal of suspended solids, trace organic matter, colour & odor. Then this treated water will discharge to irrigation/plantation.

#### **9.0 LIST OF MECHANICAL EQUIPMENTS:**

Sr. No.	Description	Qty
	Primary Treatment	
I.	Aeration Grid for Sewage Collection Tank	existing
II.	Coarse Diffuser	existing
	<b>Component in package skid mounted unit</b>	
III.	Sewage Lift Pump Set	2 No.
IV.	Inlet Chamber	1 No.
V.	Reactor Tank with Media	1 Lot.
VI.	Air Diffusers	1 Lot
VII.	Air blower with accessories	2 No.
VIII.	Aeration Grid for CHNR Reactor	1 Lot
IX.	Secondary Tube Settler Tank with Media	1 Lot.
X.	Bio-Sludge Recycling Pump	2 No.
	<i>Tertiary treatment</i>	
XI.	<i>Filter Feed tank</i>	1 No.
XII.	Filter feed + back wash pump	2 No.
XIII.	Pressure Sand Filter	1 No.
XIV.	Activated Carbon Filter	1 No.

30  
06/05/2024



XV.	Chlorine Dosing System.	1 lot.
-----	-------------------------	--------

## 10.0 TECHNICAL DETAIL OF MECHANICAL EQUIPMENTS

### I. BAR SCREEN – 1 No.

Location	At Screen Chamber
Application	Screening of floatable matter
MOC	MSEP
Size of Bar & Spacing	10 mm
Inclination	45 °C
Make	Anuj

### II. SEWAGE LIFT PUMP SET – 2 Nos.

Location	After Sewage Collection Tank
Application	To feed sewage water to reactor
Type	Horizontal, Centrifugal, self-priming, mono block
Capacity/flow	1m3/hr @ 10-12 mtr head
MOC	CI
Motor HP	3 phase, 4 Pole
Make	Kirloskar / CNP/equivalent

### III. AIR PURGING GRID - 1 Lot

Location	In Reactor
Application	For providing air Mixing
MOC	UPVC
Accessories	Complete with piping, valves and other accessories
Make	Anuj /Equivalent

*Handwritten signature/initials*



#### IV. REACTOR WITH MEDIA – 1 Lot

Location	After Sewage Collection tank
Application	For reduction of organic load
	<b>REACTOR</b>
Capacity	Suitable to handle 15m <sup>3</sup> /day
MOC	MSEP
	<b>MEDIA</b>
Size	22 MM DIA
Voidage	95 %
Sp Surface Area	400 m <sup>2</sup> /m <sup>3</sup>
MOC	PVC
Make	MM Aqua /Cooldeck/equivalent

#### V. COARSE AIR DIFFUSER – 1 Lot

Location	Inside Collection Tank
Application	For providing air for mixing
Type	Coarse membrane
Capacity	5-10 m <sup>3</sup> /hr per diffuser
Size	150 mm Dia
Make	southern Cogen/ Equivalent

#### VI. AIR DIFFUSERS – 1 Lot

Application	For providing air to the Reactor
Type	Fine air bubble membrane
Capacity	10 m <sup>3</sup> /hr/m
Length	1 m
MOC	EPDM
Make	Sothern Cogen/equivalent

#### VII. AIR BLOWER WITH ACCESSORIES – 2 Nos.

Location	Near the Reactor
Application	Supply of air for mixing
Capacity	Suitable for plant of capacity 15 m <sup>3</sup> /day
Pressure	0.4 kg/cm <sup>2</sup>
MOC	CI

*Handwritten signature*



Accessories	MS base plate, safety valves, suction filter, NRV, ant vibration pad, V – belt, Belt guard, Drive and driven pulleys
Blower makes	TMVT/ Everest / Equivalent

**VIII. SECONDARY TUBE SETTLER TANK WITH MEDIA – 1 Lot.**

Location	After Reactor
Application	Settling of suspended solids
	<b>Secondary Tube Settler Tank</b>
Description	Complete with tube settling and collection compartments suitable with Sludge withdrawal system.
Capacity	Suitable to handle 40 m <sup>3</sup> /day
MOC	MSEP
	<b>Tube Settler Media</b>
Angle	Inclination- 60°
MOC	PVC UV Stabilized
Make	Anuj/ Equivalent

**IX. BIO-SLUDGE RECYCLE PUMP – 2 No.**

Location	After Tube Settler
Application	To recycle sludge to Reactor & excess to SDB
Type	Horizontal, Centrifugal, self-priming, Monoblock
Capacity/Flow	1m <sup>3</sup> /hr @ 10 mtr head
MOC	CI
Power	3 Ph, 4 Pole
Make	Kirloskar /CNP/ Equivalent

**X. FILTER FEED + BACKWASH PUMP – 2 Nos.**

Location	Before Pressure sand filter
Application	To feed the treated effluent to PSF and ACF and for backwashing
Type	Centrifugal, Monoblock
Capacity/flow	2m <sup>3</sup> /hr@3 mtr head
MOC	CI
Motor HP	3 Phase, 4 Pole
Make	Kirloskar / CNP / Equivalent

**XI. PRESSURE SAND FILTER – 1 No.**

Location	After Filter feed tank
Application	Removal of suspended solids



Media depth	1050 mm
Media	Under bed with graded silica sand
MOC	MSEP/FRP
Make	Anuj/ Equivalent

**XII. ACTIVATED CARBON FILTER – 1 No.**

Location	After Pressure Sand Filter
Application	Removal of odor & Color
Media depth	1050 mm
Media	Under bed with graded silica sand & activated carbon
MOC	MSEP/FRP
Make	Anuj/ Equivalent

Location	Near Filter Feed Tank
Application	For disinfection
	<b>Dosing Tank – 1 No.</b>
Application	Storage of chlorine Solution
MOC	HDPE
Capacity	50 lit
	<b>Dosing Pump – 1 No.</b>
Application	To dose the Chemical
Type	Electronic, Diaphragm
Capacity	0 –4.0 LPH
Pump make	Milton Roy / Equivalent

*to*

### XIII. CHLORINE DOSING TANK WITH DOSING PUMP – 1 Lot.

#### a. DETAIL OF ELECTRICAL WORKS

Location	Near Filter Feed Tank
Application	For disinfection
	<b>Dosing Tank – 1 No.</b>
Application	Storage of chlorine Solution
MOC	HDPE
Capacity	50 lit
	<b>Dosing Pump – 1 No.</b>
Application	To dose the Chemical
Type	Electronic, Diaphragm
Capacity	0 – 4.0 LPH
Control Panel Location	MCC
Description	<p>Control panel will be fabricated in 14 SWG/ 16 SWG CRCA sheet with compartment, dust and vermin proof, wall mounted.</p> <p>One incoming feeder will be provided which will have ammeter, voltmeter, indicating lamps and energy meter.</p> <p>Outgoing feeders will be as per drives of mechanical equipment. Each outgoing feeder shall have 1 No MCB, contactor, overload relay, on/off push button, indicating lamp, neutral link and one set of terminal block.</p>
Make of switchgears	Siemens / L & T

#### I. CABLING

Description	Electrical cabling shall be provided from control panel to various units of Sewage treatment plant
Size of cable	As per the capacity of the motors / drives
MOC	Copper / Al – Unarmored
Make	CCI / Polycab / Equivalent

57



## 12.0 DETAIL OF INTERCONNECTING PIPING

Description	Supply of interconnecting piping, fitting, valves, for STP units
MOC	UPVC
Make	Astral/equivalent

## 13.0 INSTRUMENTATION:

### I. Pressure Gauges – 1 Lot.

Location	Delivery line of Pump & Blower
Application	To Indicate the Pressure
Type	Bourdon / Diaphragm
Range	0 to 4 Kg/ cm <sup>2</sup>
Make	Wika / H guru / Equivalent

### II. Level Switches - 2 Sets

Location	Inside Tanks
Application	To Indicate the low & High level
Make	Minilec / Equivalent

### III. Flow Meter - 1 No

Application	To measure the flow
Location	At raw sewage pump or After ACF
Type	Online
Make	Kranti /Equivalent

## 14.0 DETAIL OF CIVIL WORKS FOR SKID MOUNTED PACKAGE PLANT

S. No.	Description	Unit	No of Units	MOC	Status
I.	Screen cum Oil Grease Chamber	m	1	RCC	Existing
II.	Sewage collection Tank	m	1	RCC	Existing
III	Treated Water Tank	M	1	RCC/HDPE	Existing
III.	Sludge Drying Beds	m	4	BW	new

IV.	Foundation for Skid Mounted Unit	-	Lot	RCC	modification
-----	----------------------------------	---	-----	-----	--------------

#### 15. SCOPE OF SUPPLY

S. No.	Description
I.	Supply of Mechanical Equipment's as per detail above
II.	Supply of Electrical Items as per detail above
III.	Supply of piping, valves and other accessories as per detail above
IV.	Supply of Instrumentation items
V.	Supply of operation and maintenance manuals
VI.	Erection, Testing & Commissioning
VII.	Supply of GA drawings
VIII.	Supply of bacterial culture (E.M. Solution)
IX.	Design & Drawings

#### SCOPE OF WORK:

The scope of work of the contractor shall include civil, Mechanical equipment supply and erection, Electrical work. Interconnecting piping, lab testing etc., for turn key execution of the proposed sewage treatment. The plant shall be commissioned by the contractor and shall be operated by him for a period of Three year (36 months) from the date of commissioning. The contractor shall also submit waste water analysis report once in a month for this 36-month period. All Auxiliary supply and installation viz, Hand roiling, appeal ladders, work tables for laboratory, furniture for administrative office, liquid level gauge, manhole covers etc., form the part of this scope arrangement for diversion of nallah flow to the collection well is included in the scope of supply.

#### COMMISSIONING OF PLANT:

On completion of all Civil, Mechanical, Electrical work the plant shall be put under trial for a period of 15 days. During the trial period the chemicals and consumables shall be provided by the contractor and the contractor shall operation maintained the plant for a period of three years (36 months). For a period of three years chemical and consumable to be supplied by contractor.

**Warranty for Equipment:** This warranty shall be against manufacturing defects and shall be valid for a period of 12 months from the date of commissioning of the equipment or 15 months from the date of last invoiced dispatch, whichever is earlier.

#### GUARANTEE:

The contractor shall be responsible for successful operation and trouble-free service of the plant for a period of three years. Towards satisfactory performance 10 % of each RA bill shall be retained. On completion of three years from the date of commissioning the performance deposit shall be refunded after adjusting any dues.



## SCOPE OF WORK & SPECIAL CONDITIONS

**Scope of work: -** 1. Supply, Design & Drawing, Installation, Testing and Commissioning of compact, pre-fabricated and odor-free installation for Sewage Treatment Plant (STP) of 50 KLD capacity along with an Effluent Treatment Plant (ETP) of 3 KLD with UG tank (50KL), Water Supply Pipeline, Pump house & Waste water flow system at Railway Hospital, Solapur.

2. Sewage treatment plant (50KLD) with UG tank(50KL), water pipe line & pump house at Shahabad.

3. The scope also includes obtaining necessary MPCB approvals with documentation and Certification for six (06) years, and Operation & maintenance of the 50 KLD STPs with 3 KLD ETP for three (03) years after commissioning, including manpower, consumables, chemicals, cleaning, preventive and breakdown maintenance, all lead and lift, transportation, taxes, duties and all incidental charges, complete.

\*\*\*\*\*

1. The contractor shall submit the process Design, Structural Drawing, and detailed drawings for the STPs (50 KLD) and ETP (3 KLD), along with detailed specifications of all components of the complete packaged system, along with the tender documents.

2. Make and contractor shall strictly follow specifications of the equipment / machinery.

3. The tenderers should have done at least 1 work of water recycling / purification / filtration work of 50 KLD or more capacity. Tenderers without any past experience of constructing & handling such plants will be summarily rejected.

4. The contractor should arrange training of Railway staff for a period of one month. The cost for the same shall be included in the cost of the work.

5. Contractor should provide output of 90% of designed of 50 KLD i.e. he should supply at least 45 KLD else pro-rata reduction will be made from the AMC monthly amount.

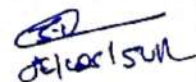
6. Completion period 12 months from the date of issue of Letter of Acceptance and Operation & Maintenance of STPs (50 KLD) and ETP (3 KLD), period 36 Months from the date of commissioning of plants.

7. The contractor shall arrange monthly testing of raw water and treated water through a Government/approved laboratory for parameters such as PH, BOD, COD, TSS, Oil & Grease, etc., in compliance with MPCB norms, at his own cost. Further, daily testing and monitoring of treated water quality shall be carried out at the STPs plant during the operation and maintenance period.

8. If the test sample fails to fall within the limits of the required standards, a penalty of ₹2,500 or higher will be levied for each case, as per the decision of the Engineer representative.

  
**Sr. DEN/S/SUR**

**\*\*\*Railway reserves the right to effect the changes as per exact / actual requirement**

  
delcar/sun

