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A

FEASIBILITY REPORT

FOR

SEWAGE TREATMENT PLANT

(Present Flow Rate 300 KLD)
(Design Capacity 400 KLD)

FOR

M/s SHOOLINI UNIVERSITY , SOLAN

Prepared By

Greentech Enviro Consultants
Ludhiana

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Plot No. 36, ST. No.1, Premier Industrial Complex, Mangli Nichi, Chandigarh Road, Ludhiana-141123

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Introduction

M/s SHOOLINI UNIVERSITY is a well-known name for its education. The organizers are very sincere and serious for the well keeping of environment and that is why they engaged M/s Greentech Enviro Consultants, Ludhiana to carry out a study for the up-gradation of STP. The main effluent generated from the Premises is domestic Sewage which is being generated from the Hostel Campus of students, Academic Block etc.

Details of project are as under

Present Flow rate: - 300 KLD

Design Flow rate: - 400 KLD

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Effluent Characteristics

Sr. No.	Parameter	Unit	Anticipated Value	Design Value	CPCB Standards (For Discharge Into Sewer)
1	pH	---	7-8	7-8	5.5 – 9.0
2	COD	Mg/l	400 -500	< 100	< 250
3	BOD	Mg/l	150- 250	< 20	< 30
4	TSS	Mg/l	150	< 50	< 100
5	Oil & Grease	Mg/l	5 -15	< 3	< 10
6	TDS	Mg/l	900 -1500	900 -1500	< 2100

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Technology Adopted

The proposed treatment will be based on following scheme

1. **Biological Treatment :** The Waste Water will contain only only organic impurities, to remove these a state of Art activated sludge Process shall be incorporated.

   Activated sludge Process: This process was developed in England in 1914 by Arden and Lockett and was named so because it involve the production of an Activated mass of micro-organism capable of aerobically stabilizing the Waste.

   The whole process may be described as below.

   Organic Material + O2+ Nutrients + Micro- Organism ==========

   === CO2 + H2O + Energy + new Micro-Organism

   The total oxidation of Organic Materials by Microorganism takes place in two phases.

   The First phase involves the conversion of organic material into CO2, H2O and new Micro-organism.

   In second phase endogenous respiration takes place in which Micro-organism consume their own cell protoplasm for energy and at the end of this phase a non biodegradable residue remains, here Initially Carbonaceous compounds are get oxidized and then nitrogenous materials are converted into Nitrites and Nitrates. In this manner total organic matter, get oxidized. The product of Treatment a well-digested sludge remains, which is very rich in nutrients and may be used as organic manure.

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The Separation of sludge from effluent leaving Bioreactor called mixed liquor happen in Secondary tube settler. The Clear Supernatant leaving Tube Settler will be further treated in Tertiary Treatment.

2. **Tertiary Treatment:** Since the effluent may contains a lot of dissolved organic matter so it may be possible that the secondary treated effluent will contain some traces of these. To remove these there will be a pair of Pressure filters. The Filter media will be Sand and Activated Carbon.

The Principle of filtration is Impaction and Adsorption on Activated carbon surface. The filter Media needs Frequently Back Wash to maintain its efficiency.

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Design Details

Sr. No.	Particular	Unit	Value
1	Anticipated Flow	Cu. M/ Day	300
2	Design Flow	Cu. M/ Day	400

1. Collection cum Equalization Tank

Since the generated sewage may contain a lot of variation in characteristics and flow rate so there is a strong need to homogenize and to regulate the flow of effluent. For this Purpose, a collection Tank will be made.

Since the Effluent from process house will have some suspended matters so there will be aeration provided with help of diffused aeration system to make the all material in suspension.

2. Primary Tube Settler:-

To Suspended material Present in the waste water a primary Tube Settler will be erected . The Separated sludge will go to the Filter Press to dewater .After Dewater it shall be used to produce the compost to use in Plantation area as organic Mannure.

3. BIO REACTOR

This unit may be termed as the heart of whole treatment system and will takes place in a complete Mix aeration System. It will be a complete mixed, suspended growth system.

Biological treatment in the Aeration tank is based on Activated Sludge Process. The objective of biological treatment is to remove organic matter, which contributes to BOD / COD. Biological waste treatment involves bringing the active microbial growth in contact with wastewater so that they can consume impurities as food.

A great variety of microorganisms play an important role. The Extended Activated Sludge Process is based on low F/M ratio. Here the wastewater is made to contact with micro-organisms present in the form of flocculent biological mass, termed as Activated Sludge. During Aeration, the microorganisms multiply by assimilating part of the influent organic matter. These microorganisms in the presence of oxygen convert biodegradable organic matter into carbon dioxide, water, more cell material and other inert products. Activated sludge process involves decomposition of cellular substance involving the formation of

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water or participation of water molecules in organic oxidation and reduction reactions. Dehydrogenation takes place within the cell and hydrogen combines with molecular oxygen making it essentially an aerobic process.

The activated sludge process takes place in two phases. During the first phase of metabolism, the conversion of organic matter to carbon dioxide, water and new cells takes place.

During the second phase, endogenous respiration takes place, in which micro Organisms consume their own cell material for energy. At the end only non-biodegradable residue is left.

BOD in wastewater is in the form of suspended solids and soluble organic material. When the wastewater is mixed with active biomass, several reactions take place. Suspended solids are enmeshed in biological flocs, colloidal solids are adsorbed on the plain interface and some soluble organics are absorbed by enzymatic reaction and synthesized. Extra cellular enzymes first break down the colloids in order to be made available to the cell. So complete stabilization of these organics requires a longer aeration time. During the endogenous phase, which is also known as extended aeration, the biodegradable portion of suspended solids is oxidized.

Oxygen is required in the activated sludge process for:

- Biological organic removal.
- Endogenous respiration where cells lyses and releases oxidisable organic compounds.
- Chemical oxygen demand as measured by immediate oxygen demand.
- Nitrification reaction if required.
- Oxygen is also required to maintain the completely mixed condition in the reactor and to maintain a particular dissolved oxygen level in the aeration tank.

The biomass is generally flocculants and is quick to settle. It is separated from the aerated effluent in the Secondary Settling Tank and is recycled continuously to the Aeration tank as an essential feature of the process. The mixture of recycled sludge and wastewater is referred to as "Mixed Liquor". The recycling of sludge helps in the initial build up of a high concentration of active micro-organisms in the Mixed Liquor, which accelerates BOD removal. Once the required concentration of the micro- organisms in the mixed liquor is reached, regulating the quantity of sludge recycled and wasting the excess from the system prevent its further increase.

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The Mixed Liquor Suspended Solids (MLSS) is generally taken as an index of the mass of active microorganisms in the Aeration tank. The Mixed Liquor Volatile Suspended Solids (MLVSS) value is also used, as it eliminates the effect of inorganic matter. The MLSS concentration is maintained around 4000mg/l (MLVSS – 3200), with the help of Return Sludge.

Basic requirement for biological treatment area.

- Mixed population of active biomass.
- Good contact between active biomass and wastewater.
- Availability of sufficient oxygen.
- Availability of sufficient nutrients.
- Favorable environmental conditions like pH, temperature, contact time
- absence of any material, which is toxic to microorganisms.

The purpose of Return Sludge arrangement is to maintain sufficient concentration of activated sludge in the Aeration tank so that required degree of treatment can be obtained in the desired time interval. The return of activated sludge from the Secondary Settling Tank to the inlet of the Aeration tank is the essential feature of the process. Return sludge from Secondary clarifier is pumped to Aeration tank using Return Sludge transfer pumps.

4. Secondary Tube Settler

To separate the Biomass produced in the Bio Reactor a Secondary Tube Settler will be erected .The Dimensions of This Tube settler will same to the Primary Tube settler. Here the notable point is that "Till now we have converted the dissolve organic matter into a settle able biomass and if this biomass remains in streams the entire treatment will be useless."

The Separated sludge will be feed regularly to Bioreactor to maintain the required MLSS concentration and incase of no requirement in Bioreactor it will be sent to Sludge Drying Bed or filter press to waste.

5. Pre Filtration Tank

The Water overflowed from Secondary Tube settler will be collected in a pre filtration Tank.

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6. Pressure Filters

There need to a pair of Pressure Filters to arrest the residues of organic matter and other suspended solids. The treated water will go to plantation area for the disposal

The Filters shall be cleaned by Back Wash Frequently which shall be depend upon pressure build up across the Filter Bed. The Back Wash water will be sent to the Collection Tank.

7. Chlorine Dosing System

The Treated may have some bacteria so disinfect the treated water Sodium Hypo Chlorite shall be dosed to Treated Water

8. Disposal

The Treated Water shall be reused in Toilet Flushing, Floor Washing, Cooling Towers etc.

9. Sludge handling system

Since The Biological sludge will be generated in a huge quantity, so to handle it a Sludge Bad will be Installed. After sun drying the digested sludge may be used in park & other areas as a organic manure.

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Technical Specifications

Sr. No.	Name of Unit	Description
	Present Flow Rate	300 KLD
	STP Capacity	400 KLD
	Flow rate per Hrs	20 Kl (20 Hrs Per day Operation)
1	**Bar screen chamber**	
	MOC	RCC
	Length	900 MM
	Width	800 MM
	Depth	1000 MM
	Free Board	200 MM
	Cross Section Area of Channel (@ 30 ° Inclined)	1 Sq. M
	MOC of Screen	SS 304
	Spacing	10 MM
2	**Oil & Grease Trap**	
	MOC	RCC
	Length	2100 MM
	Width	900 MM
	Depth	1700 MM
	Free Board	200 MM
3	**Collection cum equalization Tank**	
	MOC	RCC
	Length	14000 MM
	Width	6000 MM
	Depth	5500 MM
	Free Board	500 MM
	Volume	420Kilo Ltrs
	HRT	9.0 hrs
	Type Of Diffusers	Coarse Bubble

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	Size of Diffusers	150 MM
	Nos. of Diffusers	100 Nos
5	**Feed Pump**	
	Flow Rate	20 Kilo Liters / Hrs.
	Nos	02 (01 W & 01 Stand By)
	Head	10 M
	Line Size	80/80 MM
	Type	Centrifugal, mono block non clog type
6	**Biological Reactor**	
	No. of Tank	05
	Configuration	Complete Mix , MBBR Type
	Length	3000
	Width	3000
	Height	4000 MM
	Free Board	500 MM
	Effective Volume of Each Tank	31.5 KL
	Overall Volume	157.5
	Retention Time	9.45 Hrs Hrs.
	MLSS	5000 mg/l
	MLVSS (80 % of MLSS)	4000 mg/l
	Air Requirement for Bio reactor (with consideration of Pipe Loss, Excess Air)	300 M3/ hr.
	No. Diffusers	30
	MBBR Media	30 Cu. M
	Type of Diffusers	EPDM, 63 mm Dia, 1000 MM Length, Fine Diffusers, Silicone MOC
	MBBR Media	2 Cu. M
	Blower	
	Air Requirement In Bioreactor	600 Cu. M / Hr
	Nos.	02 (01 W + 01 Stand By)
	Motor	Any Std. Make
	Hp	Depend upon blower type
	Pressure	0.6 Kg/CM2
7	**Secondary tube settler**	
	Length	3500 MM
	Width	3500 MM
	Width Of Water weir	200 MM

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	Effective Surface Area	9.0 Sq. M
	Angle of Inclination	60°
	Plain settling area of Media	11M2/M3 (at 60° Slope)
	Settling Velocity	0.3 M/Hr.
	Height of Media	863 MM
	Free Board	200 MM
	Water above Tube	700 MM
	Silent Zone	850 MM
	Cone height	1000 MM
	Total Height	3500 MM
	MOC	MS
	Thickness of Sheet	05 mm
8	**Pre Filtration Tank**	
	MOC	RCC
	Length	6000 MM
	Width	3000 MM
	Depth	4000 MM
	Volume	72 KL
	HRT	4.32 HRS
9	**Pressure sand Filter**	
	Nos. offered	01
	Dia	1200 MM
	Height	1800 MM
	Flow Regime	Down Flow
	Media	Sand & Gravel
	Material of construction	MS
	Feed Pump	Centrifugal
	Feed Pumps Nos.	02 (01 W& 01 Stand By)
	Flow Rate	20 M3 / Hr.
	Head	15 M
10	**Activated Carbon filter**	
	Nos. offered	01
	Dia	1200 MM
	Height	1800 MM
	Flow Regime	Down Flow
	Media	Sand & Gravel & Activated Carbon
	Material of construction	MS
	Feed Pump	Centrifugal

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	Flow Rate	20 M3 / Hr.
	Head	15 M
11	**Chlorination**	
	Solution tank Volume	500 Ltrs
	Disinfectant Media	Sod. Hypo Chlorite 1 % water Solution
	Free Residual Chlorine	0.2 PPM
12	**Filter Press**	
	Size of Plates	910 X 910 Sq. MM
	Nos. of Plates	34 +1+1
	Type of Operation	Hydraulic
	Feed Pump	10 KL/ H @ 4 Kg/ Cm^2

Conclusion and summery

The study report on the feasibility of Sewage Treatment Plant proposes to be installed at M/s SHOOLINI UNIVERSITY Hitech Industries unveils that it is adequate to meet the requirement of State / Central Pollution Control Board. It enlightens the all-Technical aspects of Treatment methodology, Size, Disposal etc.

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