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Design waste water treatment plant for township

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ABSTRACT

Wastewater treatment is a process used to remove contaminants from wastewater or sewage and convert it into an effluent that can be returned to the water cycle with acceptable impact on the environment, or reused for various purposes (called water reclamation). The treatment process takes place in a wastewater treatment plant (WWTP), also referred to as a Water Resource Recovery Facility (WRRF) or a Sewage Treatment Plant (STP) in the case of domestic wastewater. Pollutants in wastewater are removed, converted or broken down during the treatment process. Wastewater is any water that has been contaminated by human use. The waste water is the used water from any combination of domestic, industrial, commercial, or agricultural activities, surface runoff or storm water We planning a residential township for 10, 000 populations. In this township we design a small waste water treatment plant. In this treatment plant we design to treat a domestic waste water. In waste water treatment plant, we design a units of waste water treatment plant.

Keywords: *waste water, Design, screening, grit chamber, sedimentation tank, oxidation pond,*

1. INTRODUCTION

Wastewater is any water that has been contaminated by human use. The waste water is the used water from any combination of domestic, industrial, commercial, or agricultural activities, surface runoff or strom water and any sewer inflow or sewer infiltration the wastewater classify as a domestic wastewater from households, municipal wastewater from communities it is also called as sewage and industrial wastewater.

Almost 80% of water supply flow back into the ecosystem as wastewater currently, India has the capacity to treat approximately 37% of its wastewater or 22, 963 million liter per day (MLD) against a daily sewage generation approximately 61, 754 MLD according to the 2015 report of the central pollution control board.

1.1 Planning of Residential township

We plan a small residential township of 10, 000 peoples. In our township we plan many areas like residential area, commercial area, education area and market area. We assume a location near Nagpur city for planning of residential Township Including area 178.91 acer, in this residential township we design a Waste water treatment plant for next 3 decades

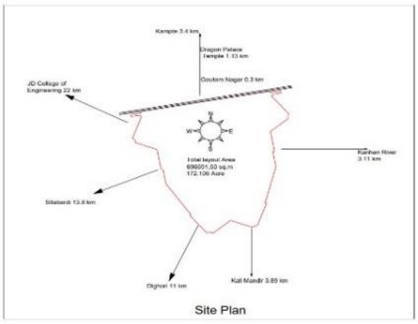

Fig. 1: Adopted location for Planning of residential Township

2. DESIGN PERIOD

2.1. Design population

For the wastewater treatment plant design a population for next 30 years for estimating water demand for next 30 years
Total population of Township in current year = 10, 000 (2021)
Calculate Population for 2051? (3 decade)

Assume the population,

Year	Population
2001	7, 000
2011	8, 000

By Incremental Increase method

Year	Population	Increase in Population	Incremental Increase
2001	7, 000		
2011	8, 00	1000	
2021	10, 000	2000	1000
2051	?		
		Total = 3000	Total = 1000

$$Pn = P0 + nX + \frac{n(n+1)}{2} \times Y$$

$$X = \frac{3000}{2} = 1500$$

$$Y = \frac{1000}{1} = 1000$$

$$P2051 = 10,000 + 3 \times 1500 + \frac{3(3+1)}{2} \times 1000$$

$$P2051 = 20,500$$

Total Population of Township for 3 decade(2051) is 20, 500

2.2 Estimate of water demand

Rate of water supply = 135 Lpcd

In case of water supply same losses occurs during supplying water so assume 20% losses

Total rate of water supply (135lpcd + 20% losses)
135 × 20, 500 = 27, 67, 500 Lpcd + 20 % Losses

Total water demand: 27, 67, 500 + 5, 53, 500 = 33, 21, 000 LPD
TWD= 3321 m^3 / day

The total water demand for 20, 500 population is 3321 m^3/day

Unit	M^3/day	M^3/hr	M^3/sec
Q	3321	138.37	0.0384

The estimated wastewater is 90% of the total water supply
So, estimated waste water is

$$= \frac{3321}{90} \times 100$$

$$= 2988.9 \frac{m^3}{day}$$

Design period	30 year
Total population	20, 500
Rate of water supply	135 lpcd
Total water Demands	3321 m^3/day
Estimated waste water (90 % of TWD)	2988.9 m^3/day

2.3 Estimate Strom Water Discharge :-

The strom runoff is that portion of precipitation, which drains over the ground. Estimation of such runoff reaching the storm on the intensity duration of the tributary area and time required for such flow to reach the sewer The strom water discharge calculated by following formula

$$Q = \frac{C \times I \times A}{3.6}$$

where, Q= Discharge (m3/s)
C=Runoff Coefficient
I= Rainfall intensity (mm/hr)
A=Area of Catchment (Km2)

Sr. No.	Parameters	Area (m2)	Area (km2)	Runoff coefficient	Rainfall Intensity (mm/hr)	Discharge (Q) m3/sec
1	Residential Buildings	239702.9	0.2397029	0.60	0.12	0.004794058
2	Play ground and club house	57515.9	0.0575159	0.25	0.12	0.000479
3	hospital Buildings	17513.25	0.01751325	0.60	0.12	0.000350
4	Secondary School Buildings	20274.59	0.02027459	0.60	0.12	0.0004054
5	Primary School Buildings	13943.92	0.01394392	0.60	0.12	0.0002788
6	Open Space	17413.25	0.01741325	0.25	0.12	0.0001451
7	Waste Water Treatment Plant	36598.3	0.0365983	0.25	0.12	0.0003049
8	solid waste management	36598.3	0.0365983	0.25	0.12	0.0003049
9	Garden / Park	17221.56	0.01722156	0.25	0.12	0.0001435
10	Garden / Park	17221.56	0.01722156	0.25	0.12	0.0001435
11	Garden / Park	17221.56	0.01722156	0.25	0.12	0.0001435
12	Amenity Area	7385.74	0.00738574	0.25	0.12	0.00006154
13	Amenity Area	7385.74	0.00738574	0.25	0.12	0.00006154
14	Commercial Building	24867.2282	0.0248672282	0.60	0.12	0.0004973
						Total Discharge = 0.00776 m3/sec

Note:- Runoff-coefficient is different for Concrete surface C= 0.60 for ground surface C= 0.25
Rainfall Intensity for Nagpur is 1064.1mm (This is annually rainfall intensity) (0.12mm/hr)

Units	M3/sec	M3/hr	M3/day
Total discharge of storm water	0.00776	29.21	701. 05

The storm water discharge for a township is 791.05 m^3/day Estimated storm water form different unit of township. The total wastewater estimated from township is addition of wastewater discharge and a storm water discharge.
Now,

Total storm water discharge = 701.05 m3/ day
waste water discharge = 2988.9 m3 / day

Total waste water discharge = total storm water discharge + waste water discharge
= 701.05 + 2988.9
Q (total waste water) = 3, 689.95 m^3/ day

Total water demand / discharge is 3321 m^3/day and Total waste water discharge is 3, 689.95 m^3/day

2.4 .Calculation for Diameter of Pipe

The drainage system is adopted in township for flowing of waste water to the wastewater treatment plant. The calculate diameter and velocity of drainage pipe. The total wastewater discharge is 3689.95 m^3/day (42.70 lit/day)

Assume the slop of pipe is 1/250 and manning coefficient of roughness of plastic pipe is 0.011 (for drainage system pipeline we adopted a plastic pipe or UPVC pipe). Manning's formula for gravity flow:

$$V = \frac{1}{n} \times [R^{0.67} S^{0.5}]$$

For Circular Conduits,

$$V = \frac{1}{n}(3.968 \times 10^{-3}) D^{0.67} S^{0.5}$$

And

$$Q = \frac{1}{n}(3.118 \times 10^{-6}) D^{2.67} S^{0.5}$$

Where,
Q= Discharge in lit/sec
S= slope of hydraulic gradient
D= Internal diameter of pipeline in mm
R= Hydraulic Radius in m
V= Velocity in m/ s
n= Mannings coefficient of roughness

Assume,

$$\text{Slope } = \frac{1}{250}$$

n= 0.011 (Plastic pipe)

(Our total waste water discharge = 3689.95 m^3/ day)

Q= 3689.95 m^3 / day = 42.70 lit / sec

Calculation for diameter :-

$$Q = \frac{1}{n} (3.118 \times 10^{-6}) D^{2.67} S^{0.5}$$

$$42.70 = \frac{1}{0.011} (3.118 \times 10^{-6}) D^{2.67} \left(\frac{1}{250}\right)^{0.5}$$

D= 244.54 , say D= 250 mm

Calculation for Velocity :-

$$V = \frac{1}{n} (3.968 \times 10^{-3}) D^{0.67} S^{0.5}$$

$$V = \frac{1}{0.011} (3.968 \times 10^{-3}) (250)^{0.67} \left(\frac{1}{250}\right)^{0.5}$$

V = 0.9 m /s

The diameter of pipe is 250 mm and the velocity of pipe is 0.9 m/s

3. DESIGN OF WASTE WATER TREATMENT PLANT

Process of wastewater treatment plant:
Wastewater follows a determined treatment path in order to achive water quality standard, regardless of weather conventional treatment or advance treatment system are used. The treatment of waste water processes divided into three parts:

(a) Primary Treatment: Primary treatment involves the sepration and homogenization of the remaining liquid waste. This solid matter will either floated or readily settle out due to gravity. Physical process such as screening and grit removal treatment large object such as stiks, polythene etc.

(b) Secondary Treatment: The secondary treatment involves a biological process. Wastewater is exposed to aerobic bacteria where the biological oxygen demand (BOD) is reduced. Aerobic bacteria are used to break down pathogens, other contaminants and suspended organic matter into carbon dioxide, water and biosolids.

(c) Tertiary Treatment: Tertiary treatment is carried out to improve the 'final look' of water, making it indistinguishable from any freshwater source. It is done to deodorize, decolor and further oxidize if required. There has been an increase in the number of wastewater treatment facilities that employ a tertiary treatment process. Tertiary treatment involves removing nutrients such as phosphorus and nitrogen from wastewater .

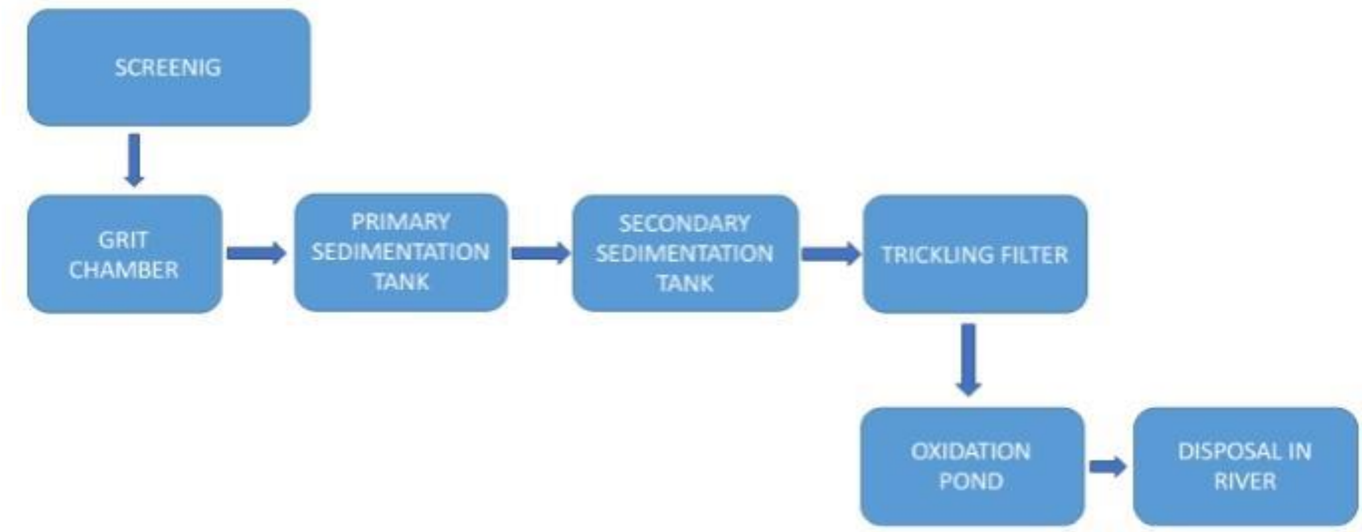

Fig. 2 Flow chart of waste water treatment plant

3.1 Design for Unit of Waste Water Treatment Plant

3.1.1 Screening: Screening is the very first operation carried out at a wastewater treatment plant and consists of passing the wastewater through different types of screens. We have design medium screen. The spacing between the bars about 6 to 40 mm this screen ordinary collect 30 to 90 liters of material per millions liter of wastewater. The screening usually contains some quantity of organic material, which may purify and become offensive, and must, therefore be disposed of by incineration. The screen is needed to trap the floating matters like sachets, plastic, milk packets, groceries bags etc. Medium screen is made of steel bars, fixed parallel to one another at desired spacing on rectangular steel frame and are called as bar screen. Assume, clear spacing between the bars is 1cm and diameter of bar is 1cm, also the depth of water is 0.5m and velocity is 0.8 m/sec which is not exceed to 0.8 m/sec

The Peak flow = 3689.95 m^3/day = 0.042 m^3/sec
Now,
Diameter of bars = 1 cm = 0.01 m
Clear spacing between bars = 1 cm = 0.01 m
Depth of water = 0.5m

Net area of screening opening required

$$A = \frac{Q}{V}$$
$$A = \frac{0.042}{0.8}$$
$$A = 0.052\ m^2$$

Net width of screen

$$\frac{Area}{depth\ of\ water} = \frac{0.052}{0.5} = 0.104\text{m}$$

Now, the numbera of openings in medium screening have clear spacing between tow bars is 0.01m

No. Of openings :-

$$\frac{Net\ width}{clear\ spacing\ between\ two\ bars}$$
$$= \frac{0.104}{0.01}$$
$$= 10.4\ Say\ 11$$

(No. of Bars will be less than no. of opening by 1)
We have
No. Of Bars = 11 – 1= 10
No. Of Ends bara = 2
Total number of bars is medium screening is 12

Total Gross width = (no. of opening) × (Clear spacing of bars) + (no. of bars) × (diameter of bars)
= 11 × 0.01 + 12 × 0.01
= 0.23 m

These screens are generally kept inclined at 60° to the direction of flow, so as increase the opening area and reduce the flow velocity
Assume inclination of screen is 60°

Now, the Length of screen is

$$= \frac{2}{\sqrt{3}} \times\ depth$$
$$= \frac{2}{\sqrt{3}} \times 0.5$$
$$= 2.3\text{ m}$$

Assume the velocity is 0.8 m/s the head loss is obtained from

$$h_L = 0.0729\ (V^2 - v^2)$$

V= velocity of flow through the screen
v= velocity of flow before screen

V = 0.8

$$v= \frac{0.8\times1}{2}$$
v= 0.4 m/s

The velocity of flow before screen is 0.4 m/s

$$h_L = 0.0729\ (V^2 - v^2)$$
$$= 0.0729\ (0.8^2 - 0.4^2)$$
$$h_L = 0.034\text{ m}$$

Length	2.3 m
Width	0.23 m
Depth	0.5 m
No. Of openings	11
No. Of bars	12
Head loss	0.34

3.1.2 Grit Chamber: Grit chamber are the sedimentation basins place in front of the waste water treatment plant to remove the inorganic particles (specific gravity about 2.65) such as sand, gravel, grit, egg shell, bones and other non-puteresible materials that may clog channel or damage pumps due to abrasion and to prevent their accumulation in sludge digester.

Actually, grit will also include smaller mineral particles that may settle as well as non-putrescible organic matter, such as rags, coffee ground, vegetables cutting etc. Generally, grit channel is design to remove all particles of higher specific gravity of 2.65 or so, with a nominal diameter of 0.20 mm and more, having settling velocity of about 21 mm/s (at 10°c) some grit removal channels are designed to remove particles having 0.15 mm size having settling velocity of about 15 mm/s (at 10°c)

3.1.2.1 Design consideration in grit chamber:

1) Settling velocity:-
It is given by stokes law for laminar flow

$$Vs = \frac{g(Density\ of\ particle - density\ of\ water\ )dp^2}{18\ \mu}$$
$$Vs = \frac{g(Gs-1)dp^2}{18v}$$

Where,
Vs= settling velocity
dp= size of particle
Gs = specific gravity

$$v= \frac{\mu}{density\ of\ water}$$

g = gravitational acceleration

2) Surface overflow rate :-

$$SOR = \frac{Q}{AS}$$

Where,
Q= flow rate
As = surface area

3) Detection period may vary from 45 to 90 sec
Generally it take as 60 sec
4) Number of units :-
    - For manually cleaned grit chamber at least tow unit shall be provided.
    - For mechanically cleaned units one additional manually cleaned unit
5) Free board of 150 × 300 mm shall be provided
6) Length can be calculated

$$L = Vh \times t$$

Where,
Vh= horizontal velocity
t= detention time

7) Depth can be calculated as

$$D = Vs \times t$$

Where,
Vs = settling velocity
t= detention time

8) Bottom slope can be provided

Design :-
Q = 3689.95 m^3/day = 0.042 m^3/sec
Maximum flow = 2.5 × 0.042 = 0.105 m^3/sec
Keeping the horizontal velocity as 0.2 m/sec (<0.227 m/sec) & detection time period as one minute

Length of the grit chamber

$$= velocity \times detention\ time$$
$$= 0.2 \times 60$$
$$= 12.0m$$

Volume of the grit chamber

$$= discharge \times detention\ time$$
$$= 0.105 \times 60$$
$$= 6.3\ m^3$$

Cross section area of flow

$$A = \frac{Volume}{length}$$
$$= \frac{6.3}{12}$$
$$= 0.525m^2$$

Provide length of chamber is 1.0 m
Hence depth is 0.525
Provide 25% additional length to accommodate inlet & outlet zone

Hence,
The length of grit chamber

$$= 12 + 1.25$$
$$= 15.0m$$

Provide 0.3 m free board and 0.25m grit accumulation zone depth
Hence, the total depth

$$= 0.525 + 0.3 + 0.25$$
$$= 1.07\ m$$

The dimension of grit chamber is length × width × depth = 15m ×1m ×1.07m

Description	Dimension	
Rectangular	Range	Typical
Depth (m)	3-5	3.5
Length (m)	15-90	25-40
Width (m)	3-24	6-10
Circular		
Diameter (m)	4-60	12-14
Depth (m)	3-5	4.5
Bottom slope(mm/m)	60-160	80

3.1.3 Primary Sedimentation Tank (Rectangular): Sedimentation or setting tank that received raw wastewater prior to biological treatment are called as primary sedimentation tank. The objective of primary sedimentation tank is to remove readily settleable organic solids and floating material and thus reduce the suspended solid content efficiently designed and operated primary sedimentation tank should remove from 50 to 70 % the suspended solids and 25 to 40% of the BOD

Recommended dimensions of sedimentation basin (as per CPHEEO):

1) Rectangular tank:
   - Tank dimension L:B (3 to 5:1)
   - Length = 30m common & maximum 100m
   - Width = 6 to 10 m
2) Circular tank:
   - Diameter not greter than 60 m, generally 20 to 40 m
   - Depth= 2.5 to 5.0 m (3m)
3) Bottom slope:

Rectangular1% towards inlet and 8% of circular

The Discharge for the primary sedimentation tank
Q = 3689.95 m^3/day = 153.74 m^3/hr
Assume the Detention period = 2 hr (1.65 – 4hr, CPHPEO manually)

$$T_d = \frac{volume}{Q}$$

Volume = T_d × Q = 2 × 153.74
V = 307.49 m^3

Assume, depth = 2.5 m (2.4 – 4 m CPHPEO manually)

$$Volume = Area \times Depth$$
$$Area = \frac{Volume}{depth} = \frac{307.49}{2.5}$$
$$A = 122.99\ m^2\ say\ 123\ m^2$$

Assume,

$$\frac{L}{B} = 2$$

(1.5 – 7.5)

$$Area = L \times B$$
$$= 2B \times B$$
$$= 2B^2$$

$$Area = 2B^2$$
$$123 = 2B^2$$

$$B = 7.84\ Say\ 8\ m$$
$$L = 2B$$
$$L = 2 \times 8$$
$$L = 16\ m$$

Provide 3 m for inlet and outlet arrangement
Total length = 16 + 3 = 19 m

Provide free board of 0.5 m and sludge depth 1m
Overall depth = 2.5 + 1.5 = 4m
Provide rectangular sedimentation tank of L × B × H = 19 m × 8m × 4m

Note- design of secondary sedimentation tank as same as primary sedimentation tank

3.1.4 Trickling Filter: A trickling filter is a part of waste water treatment system, in consists of a fixed bed rocks, coke, gravel, slag, polyurethane foam, sphagnum, peat moss, ceramic or plastic media over which wastewater flows downward and causes a layer of microbial, covering the bed of media application of trickling filter.

Trickling filter are used to remove organic matter from wastewater. The Trickling filter is an aerobic treatment system that utilized micro-organisms attached to a medium to remove organic matter from wastewater. In contrasts, system in which microorganisms are sustained in a liquid are know as suspended growth process

3.1.4.1 Design consideration:

1. Hydraulic loading :- ($m^3/m^2/day$)

$$\frac{flow\ of\ water}{filter\ surface\ area}$$

2. organic loading :- ($kg/m^3/day$)

$$= \frac{BOD\ loading}{surface\ area}$$

3. Recirculation factor :-

$$F = \frac{1 + R}{1 + 0.1R^2}$$

4. Filter efficiency :-

$$E = \frac{100}{1 + 0.44\left(\frac{\sqrt{w}}{\sqrt{V \times f}}\right)}$$

Design value :-

Parameters	Low rate trickling filters	High rate trickling filter
Hydraulic loading $M^3/m^2/day$	1-4	30-70
Organic loading BOD5 $Kg/m^3/day$	0.08- 0.32	0.5 – 1.0
Depth	1.8 – 3.0	1.3- 1.8
Recirculation ratio	None	0.5 – 3.0

For design of high rate trickling filter we assume,
BOD of raw sewage(S1) = 240mg/l
BOD removal during primary treatment = 30%
Organic loading rate = 0.8 $Kg/m^3/day$
Hydraulic loading rate= 15 $M^3/m^2/day$
Recirculation ratio = 2
We know,
Q= 3689.95 m^3/day
Influent BOD to trickling filter is 70% of BOD of raw sewages

$$= (100 - 30)\%\ of\ S1$$

$$= \frac{100 - 30}{100} \times 240$$

$$= 0.168 \frac{kg}{m^3}$$

$$S0 = 168 \frac{mg}{l}$$

Lorg = 0.8 $Kg/m^3/day$
Hlr= 15 $M^3/m^2/day$
Now, calculate volume

$$Lorg = \frac{Q \times S0}{V}$$

$$0.8 = \frac{3689.95 \times 0.168}{V}$$

$$V = 774.88\ m^3$$

Now calculate total flow,
Q= 3689.95 m^3/day

$$r = \frac{QR}{Q},\ \ QR = r \times Q$$

$$QR = 2 \times Q$$

$$Total\ flow = Q + QR$$

$$= Q + 2Q, \quad = 3Q$$

$$= 3 \times 3689.95$$

$$Qt = 11069.85 \frac{m^3}{day}$$

Now calculate area of trickling filter using hydraulic loading

$$HLR = \frac{Qt}{A}$$

$$15 = \frac{11069.85}{A}$$

$$A = 737.99m^2$$

Assume the circular trickling filter and calculate the diameter of trickling filter

$$A = \frac{\pi}{4} \times D^2$$

$$737.99 = \frac{\pi}{4} \times D^2$$

$$D = 30.65\ say\ 30m$$

So, depth is

$$Volume = \ Area \times\ depth$$

$$depth = \frac{Volume}{Area}$$

$$= \frac{774.88}{737.99}$$

$$depth = 1.04m$$

The depth of the trickling filter is 1.04m and the diameter is 30mm

Now, calculate the efficiency of trickling filter,

$$n = \frac{100}{1 + 0.44\left(\frac{Q \times S0}{\sqrt{V \times f}}\right)}$$

Where,
Q= flow rate
S0= influent BOD
V= volume
F= recirculation factor
For recirculation factor,

$$F = \frac{1 + R}{(1 + 0.1R)^2}$$

$$F = \frac{1 + 2}{(1 + 0.1 \times 2)^2}$$

$$F = 2.08$$

$$n = \frac{100}{1 + 0.4432\left(\frac{3689.95 \times 0.168}{\sqrt{777.48 \times 2.08}}\right)}$$

$$n = 78.43\%$$

3.1.5 Oxidation Pond: Oxidation ponds, also called lagoons or stabilization ponds, are large, shallow ponds designed to treat wastewater through the interaction of sunlight, bacteria, and algae. Algae grow using energy from the sun and carbon dioxide and inorganic compounds released by bacteria in water. During the process of photosynthesis, the algae release oxygen needed by aerobic bacteria. Mechanical aerators are sometimes installed to supply yet more oxygen, thereby reducing the required size of the pond. Sludge deposits in the pond must eventually be removed by dredging. Algae remaining in the pond effluent can be removed by filtration or by a combination of chemical treatment and settling.

3.1.5.1 Design consideration:

1 Areal organic loading:-

It is expressed as kg BOD5/ha.day

- Depend upon latitude
- Correction of elevation :- OLR (organic loading rate) is modified by dividing a factor of (1+0.003H)
- Sky clearance factor: For every 10% decrease in the sky clearance factor below 75% the pond area my increased by 3% Design:-

Location of township is 21N (ghorpad, nagpur maharashtra)
Assume,

BOD loading @20N = 250 kg/ha.day
Elevation = 300m,
Temperature = 35° maximum and 15°c minimum
Sky clearance is more than 75%
In fluent BOD (S0) = 200mg/l and effluent BOD (S)= 20 mg/l
K@20°c = $0.1d^{-1}$
The discharge of the waste water is 3689.95 m^3/day and the elevation is 300 m so,

$$H = \frac{300}{100} = 3$$

Now the BOD load is

$$= Q \times S0 = 3689.95 \times 0.2$$
$$= 737.99 \; say \; 738 \frac{kg}{day}$$

The areal BOD loading rate is 250 kg/ha.day now the correction for elevation

$$= (1 + 0.003H)$$
$$= (1 + 0.003 \times 3)$$
$$= 1.009$$

Hence the corrected BOD loading rate is

$$= \frac{250}{1.009} = 247.77 \frac{kg}{ha} day$$

Now calculate the area of oxidation plant,

$$Areal\ BOD\ loading\ rate = \frac{BOD\ load}{Area}$$
$$Area = \frac{BOD\ load}{areal\ BOD\ loading\ rate}$$
$$= \frac{738}{247.77}$$
$$= 2.7\ ha$$
$$A = 29700 m^2$$

The area of oxidation pond is 29700m2 now calculate detention time

$$Td = \frac{1}{k} \log\left(\frac{S0}{S}\right)$$

The k@20°c is $0.1d^{-1}$ Now calculate k@15°c,

$$k@15°c = k@20°c \times (1.047)^{T-20}$$
$$= 0.1 \times (1.047)^{15-20}$$
$$k@15°c = 0.0795\ d^{-1}$$

Then the detention time is

$$Td = \frac{1}{0.0795} \log\left(\frac{200}{20}\right)$$
$$Td = 12.58 days$$

Now calculate the volume and depth of oxidation pond

$$Td = \frac{volume}{flow\ rate}$$
$$volume = Td \times Q = 12.58 \times 3689.95$$
$$volume = 46419.57 m^2$$
$$volume = Area \times depth$$
$$Depth = \frac{volume}{Area} = \frac{46419.57}{29700}$$
$$depth = 1.56\ m$$

We have area is 2.97 or 29700 m^2

Assume, L/B = 2 (L/B ia not greater than 3)

$$Area = L \times B$$
$$= 2B \times B = 2B^2$$
$$29700 = 2B^2$$

$$B = 121.86\ say\ 122m$$
$$L = 2 \times B$$
$$L = 2 \times 122m$$
$$L = 244m$$

The dimension of the oxidation pond is L×B×D is 2.44 m ×122m ×1.26m

After the wastewater treated in oxidation pond the water released to the river.

Sr. No	Latitude	BOD5 loading (kg/ha. Day)
1	8	325
2	12	300
3	16	275
4	20	250
5	24	220
6	28	200
7	32	175
8	36	120

4. CONCLUSION

The waste water treatment plant is a treated a waste water of domestic area, The huge percentage of waste water is coming from Township for treated. And the final result is waster water is treated and flow through to the river. The design parameters of waste water treatment plant is use properly to design the unit of waste waster treatment plant

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