Waughter

AKTION CONSULTANCY

Volume 2: Edition 8 – STP Design for Indian Conditions of Tendering Aug 31, 2022

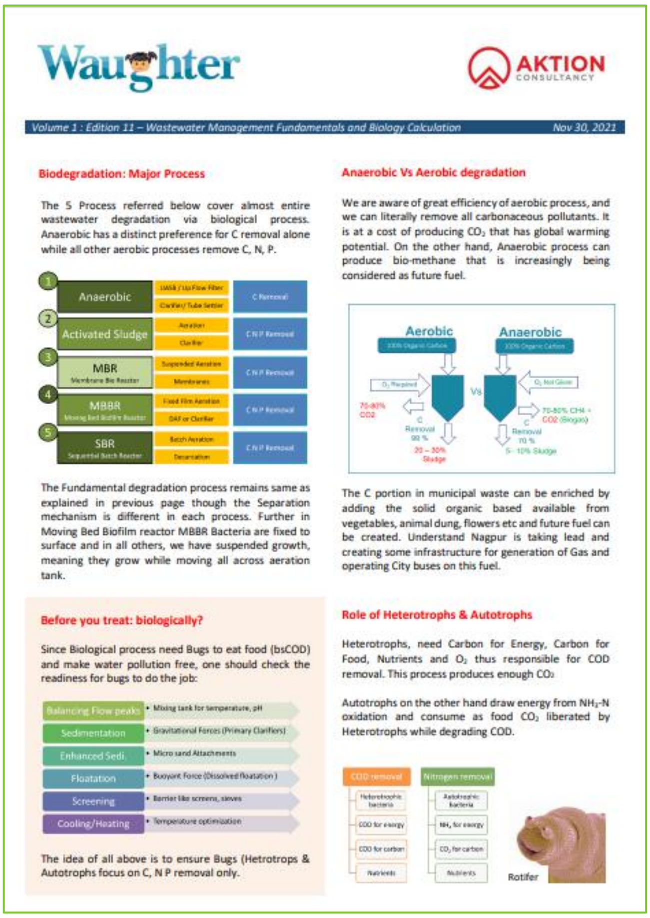
Dear Water Warriors,

With urbanization and rampant expansion of the city, the town planners had an additional problem to solve. Drainage and Sewage. As you do not want them to flood the streets.

Packaged Plants or low capacity 1-5 MLD STPs thus become essential and a lot of Class A,B,C contracts in Municipal Corporation look forward to supply STPs.

This issue of '**Waughter**', we provide a step-by-step procedure to design a Sewage Treatment Plant that can comply to CPHEEO Manual and be accepted by buyers.

Nidhi Jain – Civil Engineer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Volume 1 : Edition 11 – Wastewater Management Fundamentals and Biology Calculation *Nov 30, 2021*

Biodegradation: Major Process

The 5 Process referred below cover almost entire wastewater degradation via biological process. Anaerobic has a distinct preference for C removal alone while all other aerobic processes remove C, N, P.

The Fundamental degradation process remains same as explained in previous page though the Separation mechanism is different in each process. Further in Moving Bed Biofilm reactor MBBR Bacteria are fixed to surface and in all others, we have suspended growth, meaning they grow while moving all across aeration tank.

Before you treat: biologically?

Since Biological process need Bugs to eat food (bsCOD) and make water pollution free, one should check the readiness for bugs to do the job:

The idea of all above is to ensure Bugs (Hetrotrops & Autotrophs focus on C, N P removal only.

Anaerobic Vs Aerobic degradation

We are aware of great efficiency of aerobic process, and we can literally remove all carbonaceous pollutants. It is at a cost of producing CO_2 that has global warming potential. On the other hand, Anaerobic process can produce bio-methane that is increasingly being considered as future fuel.

The C portion in municipal waste can be enriched by adding the solid organic based available from vegetables, animal dung, flowers etc and future fuel can be created. Understand Nagpur is taking lead and creating some infrastructure for generation of Gas and operating City buses on this fuel.

Role of Heterotrophs & Autotrophs

Heterotrophs, need Carbon for Energy, Carbon for Food, Nutrients and O_2 thus responsible for COD removal. This process produces enough CO_2

Autotrophs on the other hand draw energy from NH_3-N oxidation and consume as food CO_2 liberated by Heterotrophs while degrading COD.

Waughter Vol 1 Edi 11 … ReCap

Waste Water Treatment process and design Fundamentals, Terminologies and useful formula to do some calculations e.g., Aeration Tank has been covered in previous edition.

- COD BOD etc.
- FM Ratio
- Sludge Age
- Anaerobic Vs Aerobic
- Hydraulic Retention Time
- Activated Sludge etc.

Waughter Readers, please download above from www.aktioconsultancy.com and move further for designing a UF system.

Also please download the STP design in XLS and if any difficulty please write to us to provide the same to you.

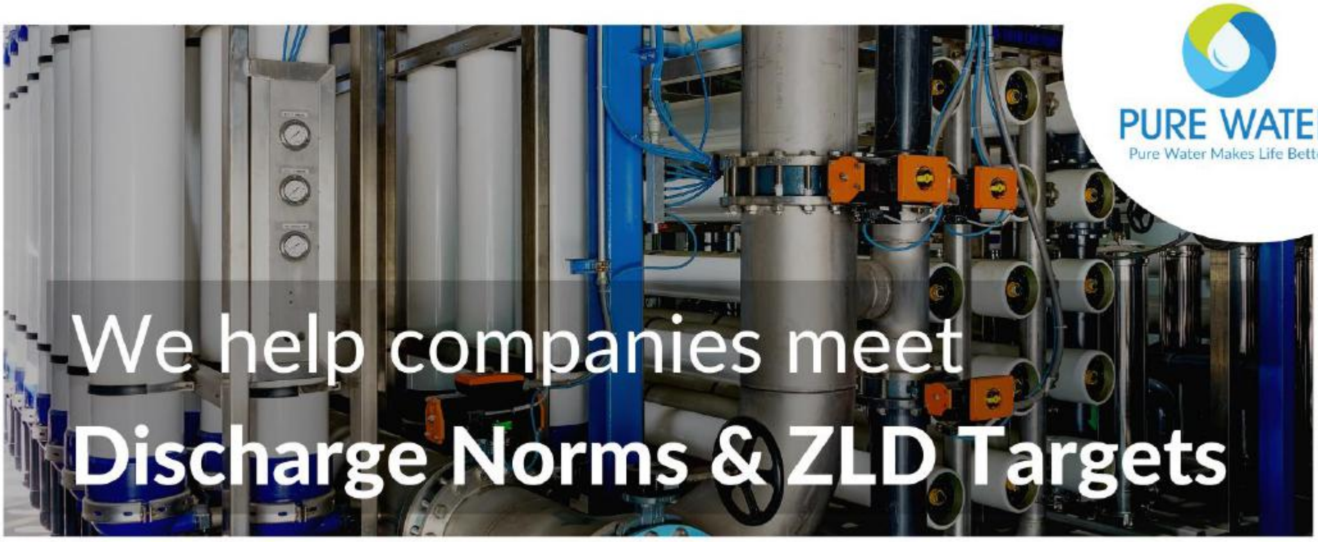
Design of UF System… defining application!

A Customer has given the problem as hereunder:

Flow Capacity	MLD	:	2
pH		:	7
BOD	mg/l	:	270
COD	mg/l	:	550
TSS	mg/l	:	250
NH_3-N	mg/l	:	34
TP	mg/l	:	6
O&G	mg/l	:	12
Source	-	:	Township
Odor	-	:	Present

Further the STP designed shall achieve BOD 30 mg/l and COD 100 mg/l and then the treated sewage shall be filtered via PSF and ACF and given to nearby Fighter Fighting Station or Garden.

Now let's understand this requirement.



Different effluents require **different technologies** to be treated

Connect with us at **Pure Water Enterprises** to discuss how we can help your industry adopt technologies which are best suited to treat your effluents.

SUEZ Water Membranes:

- RO Membranes
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- Membrane Bioreactor (MBR)
- Nanofiltration Membranes
- High Pressure RO/NF Membranes

Forward Osmosis:

- Aquaporin Forward Osmosis Membranes for concentration of high COD effluent

PUROLITE Resins:

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- Iron Removal Media
- High Hardness Resin
- Heavy Metal Removal Resin

PureOx chlorine dioxide:

- Used for COD reduction, colour removal, water disinfection and various other applications

PureCODe Media

- COD reduction media which helps in tackling and reducing tough to remove COD

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The CPHEEO Guidelines

Central Public Health & Environmental Engineering Organisation has ~ 750 pages on engineering manual that provides collection of good work of many. We present here some points that will help designer design a system that will more or less comply to what's written in manual.

First, we need to have a look at the basic compliance table:

Characteristics and Design Parameters of Activated Sludge Systems for Sewage									
Process Type	Flow Regime	MLSS	MLVSS /MLSS	F/M	HRT	θ_c	QR/Q	BOD Reduction	Kg O2/kg BOD removed
		mg/l	Ratio	Day^{-1}	h	Days	Ratio	%	Ratio
Conventional	Plug flow	1,500-3,000	0.8	0.3-0.4	4-6	5-8	0.25-0.5	85-92	0.8-1.0
Complete mix	Complete mix	3,000-4,000	0.8	0.3-0.5	4-5	5-8	0.25-0.8	85-92	0.8-1.0
Extended aeration	Complete mix	3,000-5,000	0.6	0.1-0.18	12-24	10-25	0.5-1.0	95-98	1.0-1.2

Depending upon % BOD removal objective one can design Conventional, Complete Mix or Extended Aeration. Since NH_3-N removal needs higher sludge age, we will design an extended aeration system.

Before we design

The Schematic that we wish to adopt for our design should be in our mind (see below). Further while the design capacity can be 2 MLD, the sewage is not received at Unform hourly flow.

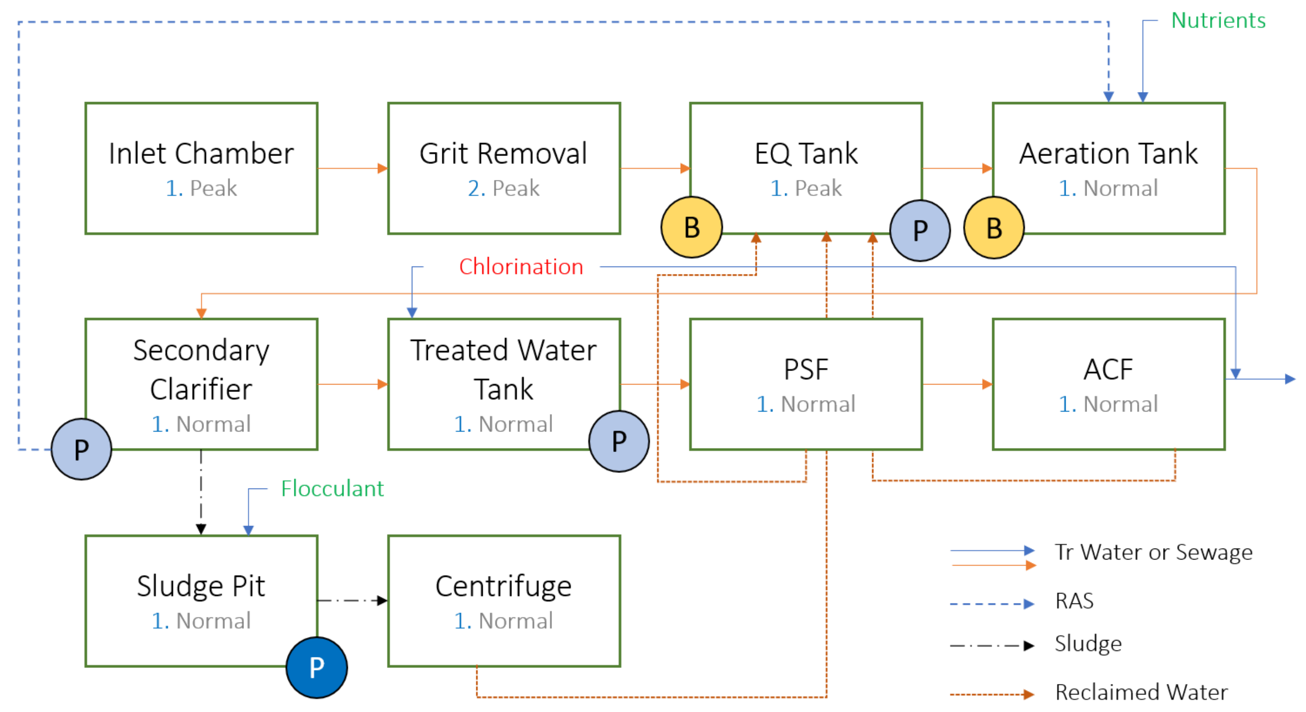
This means equalization and one cannot store water in non-aerated conditions.

Since all the sewage to STP till equalization is transported by gravity drains, we should estimate the peak flow for designing the up-stream equipment viz Inlet Chamber, Grit Chamber etc.

Accumulated Grit in Chambers would need cleaning frequently and thus we should design with a stand-by facility.

All Pumps and blowers in system, need to be 1 W + 1 S as wear and tear or occasional downtime is needed for servicing.

Scheme of Sewage Treatment Plant



Description of Parameter:

Sr No	Description of Parameter	Unit	Value	Important Point
I1	Capacity: Average Flow	MLD	2	Enter data in green Cell
I2	Quantity of Sewage Generated	lpd	2000000.00	
I3	Quantity of Sewage Generated	MLD	2.00	
I4	Quantity of Sewage Generated	m3/d	2000.00	

Raw Sewage Characteristics:

	Raw Sewage Characteristics			
1	Average Sewage flow entering the treatment plant	lpd	2000000.00	
2	Peak Factor		2	Depends upon Population, Capacity (1.1 or 3) 1.1 for Large City and 3 for 1 MLD system
3	Peak Sewage flow entering the treatment plant	lpd	4000000.00	
4	COD	mg/l	700	
5	BOD5	mg/l	228	
6	TDS	mg/l	900	
7	TSS	mg/l	85	
8	pH		7.4 - 7.7	

BOD. Is the chief parameter on which a STP is designed in Indian conditions. The other important parameter is Flow and Peak factor. The peak factor helps designer select headwork at the inlet of the plant.

Step 1 : Design Inlet Chamber

1	Inlet Chamber			
1.1	Quantity of Flow (Ave)	m3/d	2000.00	
1.2	Peak Flow	m3/d	4000.00	
1.3		m3/s	0.05	
1.4	Selected Detention period	sec	12.00	Select based on Guidline here : '10 - 30 sec (Large to small plant)
1.5	Volume of the Inlet Chamber	m3	0.56	
1.6	Selected Depth of flow	m	0.14	Enter data and check a point. Check D27, while entering data and Review D35
1.7	Area Required for Inlet Chamber	m2	4.12	
1.8	Selected Length to Breadth Ratio		1.50	Keep 1 - 1.5 max
1.9	Breadth of the Tank	m	1.70	
1.10	length of the Tank	m	2.55	
1.11	Cross Check Flux		0.20	Ensure it's as per guidline given. < 0.2 m/s (Sedimentation will occur and cleaning needed)
	Provide the Dimension of Inlet Chamber as 2.55 m x 1.7 m x 0.135 m SWD + 0.3 m Freeboard			

The only purpose of inlet chamber is to provide a place where incoming sewage pipe is terminated. Check cross flow in selecting detention time, L & B Ratio as you do not want sedimentation of grit in this tank.

Step 2 : Design Screen Chamber

2	Screen Chamber (Fine Screens)			
2.1	Peak Design Flow	m3/s	0.05	Select the Size of the screen flats of size having a thickness of 10 mm and a width (10- 50 mm Coarse Screen) (CPHEEO)
2.2	Selected Clear spacing between bars, o	mm	10.00	10 mm for Coarse Screen
2.3	Velocity ahead of screen (Va)	m/sec	0.30	(0.3 - 1.0), Lower the better
2.4	Area of Screen Channel, A= (Q/Va)	m^2	0.15	
2.5	Keeping Side Water Depth	m	0.14	Side water depth will be as per drain size design, check D 22
2.6	Width of each screen channel, W	m	1.10	
2.7	Water depth upstream, ha = A/W	m	0.13	
2.8	t	m	0.01	Screen opening (0.01 - 0.05) for 10, 50 mm Screen
2.9	Number of openings in chamber, W = X.o + (X - 1).t where , X = No. of Opening ; o = Clear Space between bars ; t = Thickness of flat	no	56.00	
2.10	Total width of opening, Ws =x*o	m	0.56	
2.11	Selected Angle of inclination	Degree	60.00	55 - 65 deg
2.12	Selected Detention Period in the Screen channel	sec	4.00	(3 - 10 sec)
2.13	Length of the screen chamber	m	1.20	
2.14	Inclined height of the screen, H1	m	0.15	
2.15	Velocity through the screen, Vs= Q/H1*Ws	m/sec	0.56	
2.16	Head loss thru screen in normal condition, $h1=0.0729(V_s^2-Va^2)$	m	0.02	< 0.15 m
2.17	Head loss on 50% clogging $h1=0.0729(2*Vs^2-Va^2)$	m	0.04	< 0.3
2.18	Water Depth downstream Hb, $(Za-Zb)+Va^2/2g-Vs^2/2g+Ha-$ Headloss thru screen in normal condition	m	0.10	Should be + ve and sufficient (To be decided based on FGL nd level of sewage entering plant)
2.19	Water Depth downstream Hb, $(Za-Zb)+Va^2/2g-Vs^2/2g+Ha-$ Headloss thru screen in clogged condition	m	0.08	Should be + ve and sufficient (To be decided based on FGL nd level of sewage entering plant)
	Provide the Dimension of Screen Chamber (Fine Screens) as 1.2 m x 1.1 m x 0.14 m SWD + 0.3 m Freeboard			

The level post screen shall be same as that of max level of grit chamber to avoid back flow.

Step 3 : Design of Grit Removal unit

Grit means the sand and other similar high Sp gr materials that can settle and need to be removed or else they damage the pump impeller.

3	Grit Removal unit			
3.1	No. of Grit channels		2.00	(1W+1SB)
3.2	Computation of Settling Velocity: Stoke's Law			
3.3	Kinematic Viscosity of Effluent at 25 deg C,μ	m2/s	0.0000011	Viscocity is temp dependent, correct based on temp.
3.4	Particle Diameter Selected	m	0.00015	(Is normal for GRIT)
3.5	Settling Velocity Vtsv=[(g/18)*(Ss-1)d^2/μ]	m/s	0.020	As per strokes's Law
3.6	Reynold's number, Re=(d.Vs/Kinematic viscosity)		2.73	if > 0.5, strokes Law does not apply.
3.7	for Transition flows, Vs=[(0.707(Ss-1)$d^{1.6}$$v^{-0.6}$)]$^{0.714}$	m/s	0.017	for 0.5 < Re < 103
3.8	Actual Setling velocity	m/s	0.017	
3.9	Removal efficiency	m3/m2/d	1474.070	
3.10	Selected Removal Efficiency	%	75.00	Keep 75 - 85%
3.11		m3/m2/d	1105.553	
3.12	Actual Surface Over Flow Rate :(Q/A)= V_sn/[$(1-n)^{-0.125}$-1]	m3/m2/d	973.844	n=0.125 for good performance
3.13	Dimensions of grit channel:			
3.14	Peak Flow	m3/d	4000.000	
3.15	Total Plan area of Grit channel = Qpeak/(Q/A)	m^2	4.110	
3.16	Selected Width of the Grit channel	m	2.50	Keep any number and Check D73
3.17	Length of the Channel	m	1.600	
3.18	Liquid Depth Selected	m	0.140	
3.19	Provide a depth for the Grit Storage	m	0.20	This depth decides the storage voulme for grit keep < 0.4 m
3.20	Critical Displacement Velocity Vc =[(8K/f)*(Ss-1)*gd]$^{0.5}$	m/s	0.161	K=0.04, f=0.03
3.21	Horizontal Velocity of Flow Vh =(peak discharge/(Horizontal arae)	m/s	0.132	Vh < Vc
	Provide the Dimension of Grit Removal unit as 1.6 m x 2.5 m x 0.34 m SWD + 0.3 m Freeboard			

For Grit to settle in chamber keep note of Critical Displacement velocity and Horizontal Velocity. If V_c is less then V_h, you are safe and GRIT will be arrested in the chamber.

Other point to note is No of Grit chambers. It should be minimum 2 as you would need time to clean the filled grit chamber.

Step 4 : Design of Equalization Tank

For a large plant some time equalization may not be present and the sewage may be directly taken to Aeration.

4	Equalization Tank (Collection Chamber)			
4.1	Peak Design Flow	m3/d	4000.00	
4.2	Selected Detention period	h	8.00	(1 - 12 h)
4.3	Volume of the Tank	m3	1333.33	
4.4	Selected Depth of Liquid column	m	5.00	(1.5 - 5)
4.5	Area required for the equalization tank	m2	266.67	
4.6	No. of Tanks Proposed		1.00	In case staggered flow have a partition
4.7	Area required for each equalization tank	m2	266.67	
4.8	Length to Breadth ratio		1.00	(1 - 1.5)
4.9	Breadth of the tank	m	16.50	
4.10	Length of the tank	m	16.50	
	Provide the Dimension of Equalization Tank (Collection Chamber) as 16.5 m x 16.5 m x 5 m SWD + 0.3 m Freeboard			

It is preferred to have minimum 2 nos Equalization of 8 hrs but if not budgeted have a minimum of 1.

Step 5 : Mixing Arrangement

Sewage as received is septic and may have some smell. If you keep that in unaerated storge, the odour will increase and septicity will be developed.

5	Mixing Arrangements			
5.1	Selected BODs reduction in the tank	Percent	5%	(Nil to 12%)
5.2	Incoming BODs of Raw sewage	mg/l	228.00	
5.3	BODs to be reduced	mg/l	11.40	
5.4	BODs Load	kg/d	45.60	
5.5	Oxygen required to remove BODs load	kg/kg of BODs	1.2	(1.2 kg O2/kg of BODs)
5.6	Oxygen required	kg/d	54.72	
5.7		kg/h	2.28	
5.8	Actual Air Required	m3/h	143.6130008	
5.9	Provide Corse bubble aeration grids for	m3/h	150.00	

It's important to mix sewage for its characteristics and we need to provide coarse bubble aeration to achieve mixing. One may achieve 5% reduction in BOD but that can not be attributed to any significant growth.

The grid design shall support 15 years of no maintenance requirement and shall be robust.

Step 6 : Raw Sewage Pump

It is preferred to have this pump with VFD and link it to level in tank. That will ensure linear propagating flow.

6	Raw Sewage Pumps			
6.1	No. of pumps		2	1 W + 1 S
6.2	Average flow	m3/d	2000	
6.3	Number of working h	h	24.00	A mustor else increse equalization size.
6.4	Flow Capacity of Pump required	m3/h	83.33333333	
6.5	Proposed pumps 2 numbers (1W + 1SB), flow per Pump	m3/h	83.33	
6.6		lps	23.14814815	
6.7	Head required	m	12.00	Experience, Check with hydraulics
6.8	HP required for pump	hp	11.5	

Step 7 : Design Aeration Tank

BOD is the basis for design of aeration tank. We need to satisfy MLSS F/M HRT and Sludge age criteria to arrive at aeration tank size.

7	Aeration tank			
7.1	No of Tanks		1.00	In case staggered flow have a partition
7.2	Flow - completely mixed			
7.3	Q- per tank	m3/d	2000	
7.4	BODs	mg/l	216.6	
7.5	MLSS	mg/l	3000.00	Extended Aeration (3000 - 5000)
7.6	Type Aeration - Diffuser type fine bubble			
7.7	Blowers -		1.00	Add Stabd By as needed
7.8	F/M Selected		0.12	0.1 - 0.18
7.9	Volume of the tank	m3	1203.333333	
7.10	Add additional volume of for sludge recycle	m3	0.00	(0% - 100%) Large to Small plants
7.11	Total volume of tank	m3	1203.333333	
7.12	Hydraulic Detention Time	h	14.44	HRT for Extended Aeration (12-24 h) if not correct F/M or MLSS
7.13	Depth of the tank	m	5.50	
7.14	Area of the Tank	m2	218.7878788	
7.15	Area for each tank	m2	218.7878788	
7.16	Selected Breadth to Length Ratio		1.50	(1 - 1.5)
7.17	width of the tank	m	12.1	
7.18	Length of tank	m	18.1	
	Provide the Dimension of Aeration tank as 18.1 m x 12.1 m x 5.5 m SWD + 0.5 m Freeboard			

For better air transfer and efficiency of blowers, keep depth > 4.5 m in Aeration Tank.

Step 8 : Blower Capacity

If you see XLS you will understand that you have to provide air enough to mee biological air requirement as well as Mixing air requirement.

8	Blower capacity			
8.1	BODs load	kg/d	456	100% No reduction in EQ
8.2		kg/h	19	
8.3	Oxygen Required for 1 kg BODs removal	kg	1.20	Guide 0.9 - 1.2 kg O2/kg of BOD
8.4	Theoretical Oxygen	kg/h	22.8	
8.5	Theoretical Oxygen	kg/d	547.2	
8.6	Density of Air @ operating temperature	gm/m3	1.22	
8.7	Content of oxygen in Air	%	0.23	
8.8	Actual requirement of air (Theoretical)	m3/d	1950.11	
8.9	Transfer Efficieny of Diffuser system per m depth		0.05	
8.10	Transfer Efficiency at design Depth		0.275	
8.11	Diffuser Fouling Factor per year		0.04	
8.12	Diffuser Life Cycle, years		3	
8.13	Diffuser Fouliing Factor for its life Cycle		1.12	
8.14	Provide Factor of Safty for Intengibles		1.1	
8.15	Conversion Factor to standard conditions		0.61	
8.16	Actual requirement of air (if Fine Air Bubble)	m3/d	14322	
8.17	Actual requirement of air (if Fine Air Bubble)	m3/h	597	
8.18	Air required for Mixing as per CPHEEO	m3/h	1155.2	Air Mixing criteria - 16 m3/min/1000 m3 of AT
8.19	Select the higher of the two above	m3/h	1155.20	
8.20	fine bubble diffuser Air Capacity.	m3/h	7.00	Vendor data
8.21	Provide Membrance diffuser for aeration tank	No.	165.0285714	
8.22	Blowers of capacity	m3/h	1155.20	
8.23	Sludge Volume Index Selected		150.00	SVI 100 to 150
8.24	Sludge Recirculation Qr/Q=Xt/((10^6/SVI)-Xt)		0.82	Correct MLSS in field based on RAS Pump selected
8.25	Volumetric loading rate	kg/m3	0.36	
8.26	(Biomass in Reactor) Xt V (without Recirculation, mass)	gm	3610000	Xt V = Alpha y Q (Yo – Ye) θc/(1 + ke θc)
8.27	Alpha Y		0.90	Yield keep (0.7 - 0.9)
8.28	Alpha y Q (Yo – Ye)		350892	
8.29	Alpha y Q (Yo – Ye) /(Biomass in Reactor)		0.0972	
8.30	Ke		0.06	
8.31	1/ θc		0.0372	
8.32	Hydraulic Mean Cell Residence Time θ_c	days	26.88	If under 15 days, Correct F/M
8.33	Selected Reduction in the Aeration Tank	%	90.00	85 - 92% for Extended Aerartion
8.34	Outlet BODs from the Aeration tank	mg/l	21.66	

Step 9 : Design Secondary Clarifier

Design it as any other clarifier keeping in mind that inlet can be twice of that of treated water to maintain the RAS flow as 100% during commissioning.

9	Secondary clarifier			
9.1	No. of Tanks		1.00	
9.2	Average Flow in each tank	m3/d	2000	
9.3	SOR	m3/m2/d	15.00	8-15 for average flow and 25-35 for peak flow for extended aeration
9.4	SWD	m	3.00	It is 2.5-3.5 m for extended aeration,
9.5	Solid conc. In settled sludge -%	%	0.90	0.8 to 0.9
9.6	Area based on SOR	m2	133.3333333	
9.7	Dia based on SOR	m	13.02940032	
9.8	Selected Detention Period	h	2.00	1.5-2 h
9.9	Volume based on DT	m3	166.6666667	
9.10	Depth of the Clarifier Selected	m	3.50	3 - 3.5 m
9.11	Area of larifier based on Detention period		47.61904762	
9.12	Area of the Clarifier (select max)	m2	133.3333333	
9.13	Provide Secondary Clarifier of Diametre	m	13.1	
9.14	Surface Loading Rate	m3/m2/d	15	
	Provide the Dimension of Secondary clarifier as 13.1 m diamtre x 3.5 m SWD + 0.5 m Freeboard			
9.15	Selected BODss reduction in Clarifier	%	1.00	I would keep NIL. Some people feel upto 20% reduction is further possible in Clarifier. So this field is kept as it is.
9.16	Outlet BODsS from Clarifier	mg/l	21.4434	

Step 10 : Return Activated Sludge/Excess Sludge Pump

10	Return Activated Sludge /Excess sludge pumps			
10.1	Type of Pumps - Centrifugal			
10.2	No. of pumps		1.00	Consider SB as per need
10.3	Selected return flow	%	100.00	50 - 100%, if 50% make number of pumps above as 2
10.4	Return sludge Pumps	m3/d	2000	
10.5	Selected		24.00	
10.6	Capacity of pump required	m3/h	83.33333333	
10.7		lps	23.14814815	
10.8	Head required	m	8.00	Depends on hydraulics
10.9	Power requirement for the Pump	Hp	5	

Simple selection – design for semi open impeller pump.

Step 11: Design Treated Sewage Sump

Detention time shall be minimum 2 hrs. One can go up-to 8 hrs and can do chlorination in this tank.

11	Treated Sewage Sump			
11.1	Selected Detention time	Minutes	120.00	Buyers Choice
11.2	Average Flow	m3/d	2000	
11.3	Volume of the tank	m3	166.6666667	
11.4	Provide a depth of tank as	m	5.00	Have a synergy with overall levels in plant
11.5	Area of the Tank	m2	33.33333333	
11.6	Square tank Size	m	5.8	
	Provide the Dimension of Treated Sewage Sump as 5.8 m x 5.8 m x 5 m SWD + 0.3 m Freeboard			

Step 12 & 13 : Design Pressure Sand Filter & Pump

Simple PSF design criteria. Have a backwash water pump designed to give 40 m/h velocity.

12	Pressure Sand Filter			
12.1	Average Flow	m3/d	2000	
12.2	Filter Operating h	h	20.00	Can go upto 22 max
12.3	Operating flow	m3/h	100	
12.4	Filter Loading rate - Rate of Filtration	m3/h/m2	12.00	Keep 9 - 16 m3/h.m2
12.5	Area of the Filter required	m2	8.333333333	
12.6	Diameter of the Filter Required	m	3.3	
	Provide the Dimension of Pressure Sand Filter as 3.3 m x Diameter with 1.8 m Shell height			

13	Filter feed Pumps			
13.1	Provide Filter feed pumps of capcity	m3/h	100	
13.2		head	15.00	depends what's after PSF
13.3	Reduction in BODs Expected in Dual media filter	%	2.00	You can expect 5% BOD Reduction post PSF
13.4	Exit BODs from the Dual media filter	mg/l	21.014532	

Step 14 : Sludge Estimation

Contact Centrifuge vendor for sludge dewatering need.

14	Sludge Production			
14.1	KgD of Excess Sludge / kg of BOD removed		0.35	0.35 -0.5
14.2	BOD Removed	kg	413.11	
14.3	MLSS Returned Activated Sludge		9900.00	3-4 times of MLSS but don't exceed 12000
14.4	Volume of sludge	m3/d	41.73	
14.5	Volume of sludge	m3/h	1.74	

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Growth & You..

"To our readers, we share the good news we are now "Aktion Waughter Private Limited" and are ready to serve you with new Vigour & Zeal"

Our new logo

AKTION WAUGHTER

The K in action replacing C is our commitment to our customers to focus on "Knowledge" we continue to serve you with:

- Training & Design Workshops
- O&M Advisory Solutions
- Pilot Study & Innovation
- Consultancy for new Projects
- Condition Assessment, Modification & Retrofit
- Chemistry Integration – Supply of speciality chemicals
- New Plants – EPC solutions in Waughter

The logo represents the globe with 70% Water and 30% land provided in Visual Identity. The colour Red comes from "Arunima" that the glow of Dawn.

And Waughter

Is the new Name for Recycled Water that is the daughter of water "Pure, Pristine and Future"

जल जीवन जननी !!

Our World is Waughter

The technical knowledge share attempt of Aktion Consultancy and the contents in the magazine shall be qualified by Sanjeev Srivastava our Technology Lead.

Our next edition focuses on: **"New Technologies and Innovation in Water"**

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