

Inclined Tube Sedimentation Tank Design Calculations

Blue block is the design datameter : be filled in

Brown: calculate process data

Red : last result for your process

1. UV Tupe Settlers----Known conditions:

water intake (Q)	5	million tons/day	0.578703704	m ³ /s
Self-use coefficient	5	%		
Then the water intake(Q')	0.60764	m ³ /s	2187.5	m ³ /h

The number of designed inclined tube sedimentation tanks is 2

Single seat Q1	0.30382	m ³ /s	1093.75	m ³ /h
Clear water area upward flow velocity	1.3	mm/s		
Take the particle settling velocity	0.3	mm/s		
Take SS and NTU correlation coefficient as	1.2			
Inlet NTU	50		60	mg/L
Effluent NTU	3		3.6	mg/L

Heat-pressed hexagonal honeycomb tube made of plastic sheet

Thickness	0.40	mm
Side distance	35	mm
Horizontal inclination	60	°

2. UV Tupe Settlers----Single Tank Calculation

a Clear water area	(A)	233.71		which the area occupied by the inclined tube structure is 3%
The actual clear water area	(A')	240.72	m ²	
Take the pool width	(B)	12	m	
Then the pool length	(L)	20.06	m	
Take	L	20.50	m	Under the condition of uniform water distribution, the water inlet is arranged along the width of the pool

b Inclined tube length L	The flow velocity in the tube V0	1.50	mm/s
Length of inclined pipe	L	405.22	mm

Considering the turbulent flow of mud accumulation at the end of the pipe, the length of the pipe in the transition area is adopted as follows			
Then the total length of the inclined pipe	L'	655.22	mm
(Take)	L'	800	mm

c. Calculation of sludge discharge Daily sedimentation tank dry sludge volume.	G	1.481	t
Take sludge water content		98	%
Take sludge density	ρ	1.03	t/m ³
Daily volume of wet sludge in sedimentation tank.	V wet	71.87	m ³

Designed to discharge sludge 6 times a day, then every 4 hours scraping sludge once

Then each time the sludge volume	V'	11.98	m ³
(Take)	V'	12.0	m ³

Installation of two sludge hoppers at the inlet end

Single bucket discharge volume V single	6.0	m ³
Take the area of the bottom surface of the hopper F1	0.6	m ²
Mud bucket on the bottom surface area F2	5.0	m ²
Mud bucket height h1	2.5	m ²
Then the volume of the mud storage part of the mud hopper	6.11	m ³
Larger than single hopper discharge	6	Meet sludge discharge requirements

The use of double wire rope traction scraper, winch platform placed in the middle of the sedimentation tank

Take the scraper height	h2	0.1	m
Scraper width	b2	6.0	m
Scraper traveling speed	V2	1.0	m/min
Two scraper a working cycle scraping amount of mud	V	1.37	m ³
Scraper a working cycle time required T		41.00	min
Diameter of discharge pipe	d	200	mm
Take the mud discharge time	T	1.5	h
Discharge mud flow rate	V	0.04	m/s

d. Sedimentation tank height			
Adoption of protection height	h	0.3	m
Clear water area height	h	1.2	m
Water distribution area height	h	1.5	m
Sludge hopper height	h	2.5	m
Inclined pipe height		0.69	m
Total height of sedimentation tank	H	6.19	m

e. Review of Re and settling time T.			
Hydraulic radius	R	8.75	mm
		0.875	cm
The flow velocity in the tube	Vo	0.15	cm/s
Take the kinematic viscosity	V	0.01	cm ² /s
then the Reynolds number	Re	13.13	
Sedimentation time	T	532.94	s
		8.88	min