# Design of of Clari-floculator and flash mixing tank

**Examlple 1 :**

**For a water treatment plant with daily output 50000 m3 – and working period = 20 hr/day .design :**

1- **Flash mixing tank.**
2- **Clari-floculator tank.**

**Solution:**

$Q_{m.m}$ = 50000 $m^3$/day = 2500 $m^3$/hr = 41.667 $m^3$/min = 0.694 $m^3$/sec

1) **Deign of flash mixing tank:**

Let T = ( 5 – 60 ) sec = 30 sec

C = Qm.m.(m3/sec.) * T = 0.694 * 30 = 20.83 m3

$$C = \pi \frac{\emptyset^2}{4} * d * n$$

Let d= 3.0 m

n = $1 tank$

get Ø: $20.83 = \pi \frac{\emptyset^2}{4} * 3 * 1$

$\therefore \emptyset = 2.97 = 3.00\ m < 35.00$ m

2) **Design of Clari-floculator tank :**

Tsed.= (2-3 ) hr = 2.5 hr

T floc. = ( 20-30)min = 30 min = 0.50 hr

a) **Outer tank :**

Tout = Tsed. + Tfloc. = 2.50+0.50 = 3.0 hr

Cout= Qm.m.(m3/hr.) * Tout = 2500 * 3 = 7500 m3

Let dout = 3.00 m

$$\therefore S.Aout = \frac{Cout}{dout} = \frac{7500}{3} = 2500 \quad m2$$

**b) Inner tank :**

Tin = Tfloc. = 0.50 hr.

Cin= Qm.m.(m3/hr.) * Tin = 2500 * 0.50 = 1250 m3

Let din = dout –0.50 m = 3 - 0.50 = 2.50 m

$$\therefore S.Aout = \frac{Cout}{dout} = \frac{1250}{2.5} = 500 \quad m2$$

**Check on surface loading rate :**

$$S.L.R. = \frac{Qm.m\ (m3/hr) * 24}{S.A.out - S.A.in} = \frac{2500 * 24}{2500 - 500} = 30 \quad m2/m2/day$$

$$S.L.R. = (25 \sim 40\ ) \quad m2/m2/day \qquad safe$$

- S.A. out = 2500 = $\pi \frac{Øout^2}{4} n$

  Let Ø out = Ø max. = 35 m

  Get n =2.59= 3.00

  Get Ø out actual = 32.57 = 32.60 m

- S.A. in = 500 = $\pi \frac{Øin^2}{4} n$

  Let n out = n in = 3 m

  Get Ø in = 14.56 = 14.60 m

**Check**

1) $\frac{Ø\ in}{Ø\ out} = \frac{14.60}{32.60} = 0.44 \qquad (0.25 \sim 0.50\ )$

2) $V\ hz = \frac{Qm.m\ (m3/min)}{n*\pi*Ø\ out*dout} = \frac{41.667}{3*\pi*32.6*3} = 0.045 \frac{m}{min} \quad < 0.30\ m/min$

3) $hyd.load = \frac{Qm.m\ (m3/hr)*24}{n*\pi*Ø\ out} = \frac{2500*24}{3*\pi*32.6} = 195.28\ m3/m2/hr \qquad (150 - 300)$

## Examlple 2 :

**For a water treatment plant with 5 Clari-floculator tank – and working period = 20 hr/day .get max. productivity of the plant :**

**Ø in = 15.00 m** **din = 2.50 m**

**Ø out = 30.00 m** **d out = 3.00 m**

## Solution:

- **S.A. out =** $\pi \frac{Øout^2}{4} n$ **= 3534.29 m2**
- **S.A. in** $= \pi \frac{Øin^2}{4} n$ **= 883.57 m2**
- **C out = S.A.out * dout = 10602.87 m3**
- **Cin = S.A.in * din = 2208.925 m3**

**Let Tin = 20 min .** $= \frac{1}{3} hr$

**Let Tout = 2 hr +** $\frac{20}{60} = \frac{7}{3} hr.$

**Qm.m 1** $= \frac{C\ out}{Tout} = \frac{10602.87}{7/3} = 4544.1\ m3/hr$

**Qm.m 2** $= \frac{C\ in}{Tin} = \frac{2208.925}{1/3} = 6626.775\ m3/hr$

$$Qm.m.3 = \frac{S.L.R. * (S.A.out - S.A.in)}{24} = \frac{40 * (3534.29 - 883.57)}{24} = 4417.87\ m3/hr$$

$$\text{Qm.m.4} = vhz * n * \pi * Ø\ \text{out} * \text{dout} * 60 = 0.3 * 5 * \pi * 30 * 3 * 60 = 25446.9\ m3/hr$$

$$Qm.m.5 = \frac{hyd.load * n * \pi * Ø\ \text{out}}{24} = \frac{300 * 5 * \pi * 30}{24} = 5890.48\ m3/hr$$

$$\therefore Qm.m. = 4417.87\ m3/hr$$