ENVE 301
2011-2012
PS # 5 –Mixing

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Question 1 (Turbine Mixer) :

Determine the power requirements for 3 m diameter, six-blade flat-blade turbine impeller mixer running at 15 rpm in a 10 m diameter mixing tank (a) with baffles (b) without baffles. Assume the fluid being mixed is water.

$T = 15^{o}C \quad , \quad \mu = 1.139 Ns/m^2 \quad \rho = 999.1 kg/m^3$

Question 2 (Turbine Mixer) :

A square rapid –mixing basin, with a depth of water equal to 1.25 times the width, ,is to be designed for a flow of 2 millions gallons per day (MGD). The velocity gradient is to be 790 fps/ft, the detention time is 40 sec, the operating temperature is 50^0F (10^0C), and the turbine shaft speed is 100 rpm. Determine:

a) The volume of the basin

b) The basin dimensions (width, length, depth

c) The impeller diameter if a a vane disc impeller with four blades is employed and the tank has four vertical baffles (one on each tank wall). The impeller diamater is to be 30 to 50 percent of the tank width.

d) The impeller diamater if no vertical baffles are used.

Question 3 (Paddle Mixers)

Determine the theoretical power requirement and the paddle area required to achieve a G value of 50 sec^{-1} in a tank with a volume of 2832 m^3.

(Water temperature = $15^0C \rightarrow \rho = 999.5 \frac{kg}{m^3}$ $\mu = 1.139.10^{-3} \frac{Nsec}{m^2}$)

C_D=for rectangular paddle =1.8

Paddle tip velocity= 0,6m/sec

Relative velocity of paddle = 0,75 $V_{paddle\ tip}$

Question 4 (Pneumatic Mixers)

A pneumatic mixing basin with a volume of 6200 ft^3 is to be designed to provide G value of 60 sec^{1}. Assume that the basin depth is to be 12ft and air will be released into the basin 0,5ft above the tank bottom.

(Temp= 60°F $\mu = 2.359.10^{-5} \frac{1bf.sec}{ft^2}$)

Figure 2.13.
Pneumatic Rapid Mixing