LSN 19 - COAGULATION/FLOCCULATION

CEEG 340–Introduction to Environmental Engineering

Instructor: Deborah Sills; 7 **October, 2019**

For Problem Set 7, you will design a water treatment facility with capacity of 3.25 MGD. Units must be sized according to acceptable ranges (Provided in Problem Set 8), and design must accommodate maintenance and repair. If you want to earn an A on the assignment, your design should also incur the lowest costs (i.e., smallest possible reactor and mixing power).

Size and Power for Coagulation

Today, you will design a rapid-mix tank used for coagulation. Last class you calculated chemical requirements. Today you will calculate power requirements, and sizing of a tank. Size a rapid-mix tank and determine the power requirements for coagulation? Use the *typical values* presented in Table 8.12 in the textbook, and in Table 1.

Table 1: **Typical values used in design of rapid-mix systems** (adapted from Mihelcic and Zimmerman).

System Category	RMS Velocity Gradient, $\bar{G}$ (s^{-1})	HRT, θ, (s)	$\bar{G}$t Values
Mechanical Mixing	600–1000	60-120	5.0×10^3 to 5.0×10^5
In-line Mixing	3,000–5,000	1	5.0×10^3 to 5.0×10^5

TO SIZE COAGULATION & FLOCCULATION TANKS, CHOOSE θ (TABLE 1).

$\theta = 90 s$

CALCULATE VOLUME, $\forall$

$$\forall = \theta \times Q = 90 s \times 3.25 \times 10^6 \frac{GAL}{DAY} \times \frac{1 DAY}{86,000 s}$$

$\boxed{\forall = 3400 \text{ GAL}}$ $\boxed{\forall = 13 m^3}$

TO SIZE MIXER, CHOOSE $\bar{G}$

$$\bar{G} = 800\ \frac{1}{s}\ ,\ \mu_{10°C} = 1.31 \times 10^{-3}\ \frac{N \cdot s}{m^2}$$

$$P = \bar{G}^2 \mu \forall = \left(800\frac{1}{s}\right)^2 \times 1.31 \times 10^{-3}\ \frac{N \cdot s}{m^2} \times 13\ m^3$$

$$P = 10{,}816\ \frac{N \cdot m}{s} = 10{,}816\ \frac{J}{s} = 10{,}816\ \text{WATT}$$

$$\boxed{P_{MIXER} = 11\ \text{KWATT}}$$