

Conversions

water at normal conditions: 7.48 gal/ft³ 62.4 lb/ft³ 3.785 L/gal 8.34 lb/gal
454 g/lb 2.54 cm/in 1000 L/m³

Equations

$$y = L_0(1 - 10^{-k \cdot t}) \quad \frac{dD}{dt} = k_1L - k_2D \quad G = \sqrt{\frac{P}{\mu \cdot V}} \quad g = 9.81 \text{ m/s}^2$$

$$Q = \frac{V}{\tau} \quad \text{PFR: } C = C_0 e^{-k \cdot \tau} \text{ (first order)} \quad \text{OR} = Q/A_s$$

$$\text{PFR: } 1/C = 1/C_0 + k \cdot \tau \text{ (second order)}$$

$$L_m Q_m = L_s Q_s + L_w Q_w \quad \frac{F}{M} = \frac{\text{lb BOD}_5 \text{ fed to the system per day}}{\text{lb MLVSS}}$$

$$K_T = K_{20} \theta^{(T-20)} \quad N/N_0 = e^{-r \cdot t} \quad k = A_0 \cdot e^{-\frac{E_a}{R \cdot T}}$$

$\theta = 1.135 \text{ (} 4 < T < 20 \text{)}$
 $\theta = 1.056 \text{ (} 20 < T < 30 \text{)}$

$$X_{(x,y,0)} = \frac{Q}{\pi S_y S_z U} \left(\exp \left[-\frac{1}{2} \left(\frac{y}{S_y} \right)^2 \right] \cdot \exp \left[-\frac{1}{2} \left(\frac{H}{S_z} \right)^2 \right] \right) \quad \text{Re} = \frac{v_t \cdot D \cdot \rho_l}{\mu}$$

$$v_t = \frac{D^2 (\rho_s - \rho_l) g}{18 \mu} \quad \text{TS} = \text{DS} + \text{SS} = \text{FDS} + \text{VDS} + \text{FSS} + \text{VSS} \quad \frac{dN}{dt} = -kN$$

$$\text{CSTR: } \frac{C}{C_0} = \frac{1}{1 + k \cdot \tau} \text{ (first order)} \quad \theta_c = \frac{\text{mass MLVSS in system}}{\text{mass MLVSS leaving per day}}$$

$$E = \frac{\text{volume of solid waste} + \text{volume of cover}}{\text{volume of solid waste}} \quad V_{\text{LF}} = \frac{(\text{mass of waste delivered / time}) \cdot E}{\text{compacted density}}$$

$$\text{SVI} = \text{Settled Sludge Volume/MLSS} * 1000 \quad X_r = 10^6 / \text{SVI}$$

$$h_L = \frac{1.067 \cdot V_a^2 \cdot D}{\phi \cdot g \cdot \varepsilon^4} \sum_{i=1}^n \frac{C_D \cdot f}{d} \quad C_D = \frac{24}{\text{Re}}$$
$$C_D = \frac{24}{\text{Re}} + \frac{3}{\sqrt{\text{Re}}} + 0.34$$

$$S = \frac{K_s}{\theta_c \cdot \mu_{\text{max}} - 1} \quad X = Y(S_0 - S) \frac{\theta_c}{\theta}$$