Floc Sedimentation Model

Adachi, Y., and Tanaka, Y. (1997). "Settling velocity of an aluminum kaolinite floc." *Water Res.*, **31**(4), 449-454..

Physical Constants

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$$\rho_{\rm W} := 998.2 \, \frac{\rm kg}{\rm m^3}$$

Density of water (at 20 deg C)

$$\mu_W \coloneqq 0.0010016 \cdot \frac{N \cdot s}{m^2} *$$

Dynamic viscosity of water (at 20 deg C)

$$\nu_{W} := \frac{\mu_{W}}{\rho_{W}} = 1.003 \cdot \frac{mm^2}{s}$$

Kinematic viscosity of water (at 20 deg C)

$$g = 9.807 \frac{m}{s^2}$$

Gravitational acceleration

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Model Inputs

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Range of Floc Sizes

$$d_{Floc.Range} \coloneqq 0.001mm, 0.002mm..1mm$$

Range of particle sizes

Primary Particle Properties

$$\rho_{Floc0} \coloneqq 2640 \, \frac{kg}{m^3}$$

Particle density (supended clay particles)

$$d_0 := 1 \mu m$$

Primary particle size

Floc Properties

$$D_{Fractal} := 2.3$$

Floc fractal dimension

$$\varphi \coloneqq \frac{45}{24}$$

Floc shape factor

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Floc Settling Velocity

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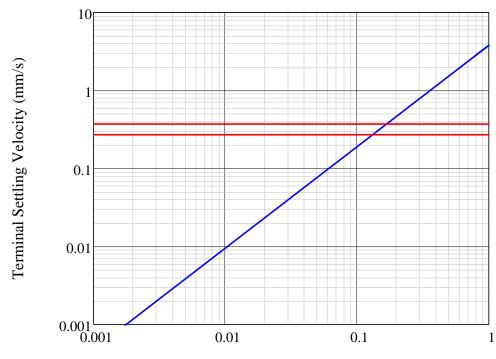
$$V_t(d) := \left(\frac{g \cdot d_0^2}{18 \varphi \cdot \nu_w}\right) \cdot \left(\frac{\rho_{Floc0} - \rho_w}{\rho_w}\right) \cdot \left(\frac{d}{d_0}\right)^{D_{Fractal} - 1}$$

$$V_{\text{Capture.Low}} := 0.27 \frac{\text{mm}}{\text{s}} \qquad V_{\text{Capture.High}} := 0.37 \frac{\text{mm}}{\text{s}}$$

$$V_{\text{Capture.High}} = 0.37 \frac{\text{mn}}{\text{s}}$$

Range of capture velocities at the existing sed tanks

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Floc Diameter (mm)