

Sedimentation Example 2

Group Problem

- Estimate the settling velocity of the floc particles we have seen in lab - especially the jar test results.
- Use Stokes' law to estimate the settling velocity.
- What are "good" estimates of the particle density and diameter?
- How does your estimate compare to what you have seen in the lab?

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- What are "good" estimates of the particle density and diameter?
- Let's assume the following values:
 - Particle density = 1,100 kg/m³
 - Particle diameter = 10⁻⁴ m

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$$v_p = v_s = OFR = \frac{(\rho_p - \rho_w)d^2g}{18\mu}$$

$$= \frac{\left(1,100 \frac{\text{kg}}{\text{m}^3} - 998 \frac{\text{kg}}{\text{m}^3}\right) (1 \times 10^{-4} \text{ m})^2 \left(9.81 \frac{\text{m}}{\text{s}^2}\right)}{18 \left(1.01 \times 10^{-3} \frac{\text{kg}}{\text{ms}}\right)}$$

$$= 5.5 \times 10^{-4} \text{ m/s} = 0.055 \text{ cm/s}$$

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$$OFR = 5.5 \times 10^{-4} \text{ m/s} = 0.055 \text{ cm/s}$$

$$OFR = \left(\frac{0.055 \text{ cm}}{\text{s}}\right) \left(\frac{\text{cm}^2}{\text{cm}^2}\right) \left(\frac{86,400 \text{ s}}{\text{day}}\right) \left(\frac{1 \text{ gal}}{3785.41 \text{ cm}^3}\right) \left(\frac{30.48 \text{ cm}}{1 \text{ ft}}\right)^2$$

$$OFR = 1,166.3 \frac{\text{gpd}}{\text{ft}^2}$$

For ferric chloride typical OFRs are in the 700 - 1,000 gpd/ft.²