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Design of Rapid Mix Basin and Flocculation Basin Formulas

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List of 19 Design of Rapid Mix Basin and Flocculation Basin Formulas

Design of Rapid Mix Basin and Flocculation Basin ⟳

1) Dynamic Viscosity given Mean Velocity Gradient ⟲

Open Calculator ⟲

$$fx \quad \mu_{viscosity} = \left(\frac{P}{(G)^2 \cdot V} \right)$$

$$ex \quad 833.3333P = \left(\frac{3kJ/s}{(2s^{-1})^2 \cdot 9m^3} \right)$$

2) Dynamic Viscosity given Power Requirement for Flocculation ⟲

Open Calculator ⟲

$$fx \quad \mu_{viscosity} = \left(\frac{P}{(G)^2 \cdot V} \right)$$

$$ex \quad 833.3333P = \left(\frac{3kJ/s}{(2s^{-1})^2 \cdot 9m^3} \right)$$

3) Dynamic Viscosity given Power Requirement for Rapid Mixing Operations ⌕

$$fx \quad \mu_{\text{viscosity}} = \left(\frac{P}{(G)^2 \cdot V} \right)$$

$$ex \quad 833.3333P = \left(\frac{3\text{kJ/s}}{(2\text{s}^{-1})^2 \cdot 9\text{m}^3} \right)$$

4) Flow Rate of Secondary Effluent given Volume of Flocculation Basin ⌕

$$fx \quad Q_e = \frac{V \cdot T_{m/d}}{T}$$

$$ex \quad 0.54\text{m}^3/\text{s} = \frac{9\text{m}^3 \cdot 0.30}{5\text{s}}$$

5) Hydraulic Retention Time given Volume of Rapid Mix Basin ⌕
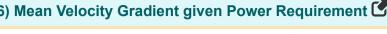
$$fx \quad \theta_s = \frac{V_{\text{rapid}}}{Q_{Fr'}}$$

$$ex \quad 7\text{s} = \frac{196\text{m}^3}{28\text{m}^3/\text{s}}$$

6) Mean Velocity Gradient given Power Requirement 📲

fx $$G = \sqrt{\dfrac{P}{\mu_{\text{viscosity}} \cdot V}}$$

Open Calculator 📲
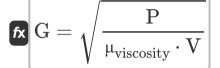
ex $$2.000004 \text{s}^{-1} = \sqrt{\dfrac{3 \text{kJ/s}}{833.33 \text{P} \cdot 9 \text{m}^3}}$$
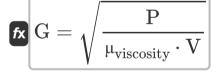
7) Mean Velocity Gradient given Power Requirement for Flocculation 📲

fx $$G = \sqrt{\dfrac{P}{\mu_{\text{viscosity}} \cdot V}}$$

Open Calculator 📲

ex $$2.000004 \text{s}^{-1} = \sqrt{\dfrac{3 \text{kJ/s}}{833.33 \text{P} \cdot 9 \text{m}^3}}$$

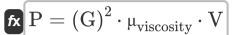## 8) Mean Velocity Gradient given Power Requirement for Rapid Mixing Operations 📲

fx $$G = \sqrt{\dfrac{P}{\mu_{\text{viscosity}} \cdot V}}$$

Open Calculator 📲

ex $$2.000004 \text{s}^{-1} = \sqrt{\dfrac{3 \text{kJ/s}}{833.33 \text{P} \cdot 9 \text{m}^3}}$$

9) Power Requirement for Flocculation in Direct Filtration Process 🔗

fx $P = (G)^2 \cdot \mu_{\text{viscosity}} \cdot V$

Open Calculator 🔗

ex $2.999988\text{kJ/s} = (2s^{-1})^2 \cdot 833.33P \cdot 9m^3$

10) Power Requirement for Rapid Mixing Operations in Wastewater Treatment 🔗

fx $P = (G)^2 \cdot \mu_{\text{viscosity}} \cdot V$

Open Calculator 🔗

ex $2.999988\text{kJ/s} = (2s^{-1})^2 \cdot 833.33P \cdot 9m^3$

11) Power Requirement given Mean Velocity Gradient 🔗

fx $P = (G)^2 \cdot \mu_{\text{viscosity}} \cdot V$

Open Calculator 🔗

ex $2.999988\text{kJ/s} = (2s^{-1})^2 \cdot 833.33P \cdot 9m^3$

12) Required Volume of Flocculation Basin 🔗

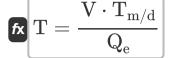fx $V = \dfrac{T \cdot Q_e}{T_{m/d}}$

Open Calculator 🔗

ex $9m^3 = \dfrac{5s \cdot 0.54m^3/s}{0.30}$

13) Retention Time given Volume of Flocculation Basin 🔗

$$fx \quad T = \frac{V \cdot T_{m/d}}{Q_e}$$

$$ex \quad 5s = \frac{9m^3 \cdot 0.30}{0.54m^3/s}$$
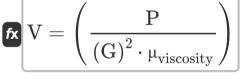
14) Time in Minutes Per Day given Volume of Flocculation Basin 🔗

$$fx \quad T_{m/d} = \frac{T \cdot Q_e}{V}$$

$$ex \quad 0.3 = \frac{5s \cdot 0.54m^3/s}{9m^3}$$

15) Volume of Flocculation Basin given Power Requirement for Flocculation 🔗

$$fx \quad V = \left(\frac{P}{(G)^2 \cdot \mu_{viscosity}} \right)$$

$$ex \quad 9.000036m^3 = \left(\frac{3kJ/s}{(2s^{-1})^2 \cdot 833.33P} \right)$$

16) Volume of Mixing Tank given Mean Velocity Gradient ⤴

Open Calculator ⤴

$$\text{fx} \quad V = \left(\frac{P}{(G)^2 \cdot \mu_{\text{viscosity}}} \right)$$

$$\text{ex} \quad 9.000036 \text{m}^3 = \left(\frac{3\text{kJ/s}}{(2\text{s}^{-1})^2 \cdot 833.33\text{P}} \right)$$

17) Volume of Mixing Tank given Power Requirement for Rapid Mixing Operations ⤴

Open Calculator ⤴

$$\text{fx} \quad V = \left(\frac{P}{(G)^2 \cdot \mu_{\text{viscosity}}} \right)$$

$$\text{ex} \quad 9.000036 \text{m}^3 = \left(\frac{3\text{kJ/s}}{(2\text{s}^{-1})^2 \cdot 833.33\text{P}} \right)$$

18) Volume of Rapid Mix Basin ⤴

Open Calculator ⤴

$$\text{fx} \quad V_{\text{rapid}} = \theta \cdot W$$

$$\text{ex} \quad 196 \text{m}^3 = 7\text{s} \cdot 28\text{m}^3/\text{s}$$
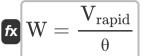
19) Wastewater Flow given Volume of Rapid Mix Basin ⌇

Open Calculator ⌇

$$fx \quad W = \frac{V_{\text{rapid}}}{\theta}$$

$$ex \quad 28\text{m}^3/\text{s} = \frac{196\text{m}^3}{7\text{s}}$$

Variables Used

- **G** Mean Velocity Gradient *(1 Per Second)*
- **P** Power Requirement *(Kilojoule per Second)*
- **Q_e** Flow Rate of Secondary Effluent *(Cubic Meter per Second)*
- **$Q_{Fr'}$** Francis Discharge with Suppressed End *(Cubic Meter per Second)*
- **T** Retention Time *(Second)*
- **$T_{m/d}$** Time in Min Per Day
- **V** Volume of Tank *(Cubic Meter)*
- **V_{rapid}** Volume of Rapid Mix Basin *(Cubic Meter)*
- **W** Waste Water Flow *(Cubic Meter per Second)*
- **θ** Hydraulic Retention Time *(Second)*
- **$θ_s$** Hydraulic Retention Time in Seconds *(Second)*
- **$μ_{viscosity}$** Dynamic Viscosity *(Poise)*

Constants, Functions, Measurements used

- Function: **sqrt**, sqrt(Number)
  A square root function is a function that takes a non-negative number as an input and returns the square root of the given input number.
- Measurement: **Time** in Second (s)
  Time Unit Conversion 🔗
- Measurement: **Volume** in Cubic Meter (m³)
  Volume Unit Conversion 🔗
- Measurement: **Power** in Kilojoule per Second (kJ/s)
  Power Unit Conversion 🔗
- Measurement: **Volumetric Flow Rate** in Cubic Meter per Second (m³/s)
  Volumetric Flow Rate Unit Conversion 🔗
- Measurement: **Dynamic Viscosity** in Poise (P)
  Dynamic Viscosity Unit Conversion 🔗
- Measurement: **First Order Reaction Rate Constant** in 1 Per Second (s⁻¹)
  First Order Reaction Rate Constant Unit Conversion 🔗

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