Important Design of a Chlorination System for Wastewater Disinfection Formulas PDF

Formulas
Examples
with Units

List of 11
Important Design of a Chlorination System for Wastewater Disinfection Formulas

1) Average Daily Consumption of Chlorine Formula

Evaluate Formula

Formula

$$Cl_2 = D \cdot Q_a \cdot 8.34$$

Example with Units

$$8.3335\,\text{kg/d} = 0.004626\,\text{mg/L} \cdot 2.5\,\text{m}^3\text{/s} \cdot 8.34$$

2) Average Flow given Average Daily Consumption of Chlorine Formula

Evaluate Formula

Formula

$$Q_a = \left(\frac{Cl_2}{D \cdot 8.34}\right)$$

Example with Units

$$3\,\text{m}^3\text{/s} = \left(\frac{10\,\text{kg/d}}{0.004626\,\text{mg/L} \cdot 8.34}\right)$$

3) Average Flow given Capacity of Chlorinator at Peak Flow Formula

Evaluate Formula

Formula

$$Q_a = \left(\frac{Cl_2}{D \cdot f \cdot 8.34}\right)$$

Example with Units

$$3.0003\,\text{m}^3\text{/s} = \left(\frac{10\,\text{kg/d}}{0.004626\,\text{mg/L} \cdot 0.9999 \cdot 8.34}\right)$$

4) Capacity of Chlorinator at Peak Flow Formula

Evaluate Formula

Formula

$$Cl_2 = D \cdot Q_a \cdot 8.34 \cdot f$$

Example with Units

$$8.3326\,\text{kg/d} = 0.004626\,\text{mg/L} \cdot 2.5\,\text{m}^3\text{/s} \cdot 8.34 \cdot 0.9999$$

5) Dosage Used given Average Daily Consumption of Chlorine Formula

Evaluate Formula

Formula

$$D = \left(\frac{Cl_2}{8.34 \cdot Q_a}\right)$$

Example with Units

$$0.0056\,\text{mg/L} = \left(\frac{10\,\text{kg/d}}{8.34 \cdot 2.5\,\text{m}^3\text{/s}}\right)$$

6) Dosage Used given Capacity of Chlorinator at Peak Flow Formula

Evaluate Formula

Formula

$$D = \left(\frac{Cl_2}{f \cdot Q_a \cdot 8.34}\right)$$

Example with Units

$$0.0056\,\text{mg/L} = \left(\frac{10\,\text{kg/d}}{0.9999 \cdot 2.5\,\text{m}^3\text{/s} \cdot 8.34}\right)$$

7) Number of Coliform Organisms at any Initial Time Formula

Evaluate Formula

Formula

$$N_0 = \left(\frac{N_t}{\left(1 + 0.23 \cdot C_t \cdot t\right)^{-3}} \right)$$

Example with Units

$$4 = \left(\frac{3}{\left(1 + 0.23 \cdot 0.364646\,\text{mg/L} \cdot 20\,\text{min}\right)^{-3}} \right)$$

8) Number of Coliform Organisms at Any Particular Time Formula

Evaluate Formula

Formula

$$N_t = N_0 \cdot \left(1 + 0.23 \cdot C_t \cdot t\right)^{-3}$$

Example with Units

$$3 = 4 \cdot \left(1 + 0.23 \cdot 0.364646\,\text{mg/L} \cdot 20\,\text{min}\right)^{-3}$$

9) Peaking Factor given Capacity of Chlorinator at Peak Flow Formula

Evaluate Formula

Formula

$$f = \left(\frac{Cl_2}{Q_a \cdot 8.34 \cdot D} \right)$$

Example with Units

$$1.2 = \left(\frac{10\,\text{kg/d}}{2.5\,\text{m}^3\text{/s} \cdot 8.34 \cdot 0.004626\,\text{mg/L}} \right)$$

10) Residence Time given Number of Coliform Organisms at Any Particular Time Formula

Evaluate Formula

Formula

$$t = \frac{\left(\frac{N_0}{N_t}\right)^{\frac{1}{3}} - 1}{0.23 \cdot C_t}$$

Example with Units

$$20\,\text{min} = \frac{\left(\frac{4}{3}\right)^{\frac{1}{3}} - 1}{0.23 \cdot 0.364646\,\text{mg/L}}$$

11) Total Chlorine Residual at Any Particular Time Formula

Evaluate Formula

Formula

$$C_t = \frac{\left(\frac{N_0}{N_t}\right)^{\frac{1}{3}} - 1}{0.23 \cdot t}$$

Example with Units

$$0.3646\,\text{mg/L} = \frac{\left(\frac{4}{3}\right)^{\frac{1}{3}} - 1}{0.23 \cdot 20\,\text{min}}$$

Variables used in list of Design of a Chlorination System for Wastewater Disinfection Formulas above

- C_t Chlorine Residual *(Milligram per Liter)*
- Cl_2 Chlorine Required *(Kilogram per Day)*
- **D** Dosage *(Milligram per Liter)*
- **f** Peaking Factor
- N_0 Number of Coliform
- N_t Number of Coliform at Initial Time
- Q_a Average Flow *(Cubic Meter per Second)*
- **t** Residence Time *(Minute)*

Constants, Functions, Measurements used in list of Design of a Chlorination System for Wastewater Disinfection Formulas above

- Measurement: **Time** in Minute (min)
  Time Unit Conversion
- Measurement: **Volumetric Flow Rate** in Cubic Meter per Second (m^3/s)
  Volumetric Flow Rate Unit Conversion
- Measurement: **Mass Flow Rate** in Kilogram per Day (kg/d)
  Mass Flow Rate Unit Conversion
- Measurement: **Density** in Milligram per Liter (mg/L)
  Density Unit Conversion

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