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Salinity Variations with Tide Formulas

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List of 19 Salinity Variations with Tide Formulas

Salinity Variations with Tide

1) Apparent Dispersion Coefficient which includes all Mixing Effects

$$\text{fx } D = \frac{D_0 \cdot B}{x + B}$$

[Open Calculator !\[\]\(a870788d6ed9b8fd294b7654a8c8526b_img.jpg\)](#)

$$\text{ex } 0.6 = \frac{3.15 \cdot 4\text{m}}{17\text{m} + 4\text{m}}$$

2) Coordinate along Channel given Apparent Dispersion Coefficient

$$\text{fx } x = \left(D_0 \cdot \frac{B}{D} \right) - B$$

[Open Calculator !\[\]\(c50c8b7b2cc2cf9ff925edec0ee94c0d_img.jpg\)](#)

$$\text{ex } 17\text{m} = \left(3.15 \cdot \frac{4\text{m}}{0.6} \right) - 4\text{m}$$

3) Diffusion Coefficient

$$\text{fx } D_0 = D \cdot \frac{x + B}{B}$$

[Open Calculator !\[\]\(f60b7a900783ac3fd531bfd9c111be6d_img.jpg\)](#)

$$\text{ex } 3.15 = 0.6 \cdot \frac{17\text{m} + 4\text{m}}{4\text{m}}$$

4) Dimensionless Estuary number

$$\text{fx } E = \frac{P \cdot Fr^2}{Q_r \cdot T}$$

[Open Calculator !\[\]\(83bbbd261710c59db0214aa27b2edc0d_img.jpg\)](#)

$$\text{ex } 6.153846 = \frac{40\text{m}^3 \cdot (10)^2}{5\text{m}^3/\text{s} \cdot 130\text{s}}$$



5) Dimensionless Stratification Number 

$$fx \quad n = \frac{r}{p}$$

[Open Calculator !\[\]\(cbe80b694ebd74fcfe136a095b608235_img.jpg\)](#)

$$ex \quad 2.5 = \frac{45}{18}$$

6) Estuary Number given Froude Number and Mixing Parameter 

$$fx \quad E = \frac{Fr^2}{M}$$

[Open Calculator !\[\]\(3e2231b1ad3ca8da8658228c00dd08e0_img.jpg\)](#)

$$ex \quad 6.153846 = \frac{(10)^2}{16.25}$$

7) Fresh Water River Flow given Dimensionless Estuary number 

$$fx \quad Q_r = \frac{P \cdot Fr^2}{E \cdot T}$$

[Open Calculator !\[\]\(0d5ec72f61334709c3fc9450209b754f_img.jpg\)](#)

$$ex \quad 4.999875m^3/s = \frac{40m^3 \cdot (10)^2}{6.154 \cdot 130s}$$

8) Fresh Water River Flow given Mixing Parameter 

$$fx \quad Q_r = \frac{M \cdot P}{T}$$

[Open Calculator !\[\]\(b64b40baaee5acddc1eab8538ba84754_img.jpg\)](#)

$$ex \quad 5m^3/s = \frac{16.25 \cdot 40m^3}{130s}$$

9) Froude Number based upon Maximum Flood Current Velocity at Estuary Mouth 

$$fx \quad Fr = \sqrt{E \cdot M}$$

[Open Calculator !\[\]\(aff7c69c44a5e015f18c35867ef3f5c3_img.jpg\)](#)

$$ex \quad 10.00012 = \sqrt{6.154 \cdot 16.25}$$



10) Froude Number given Dimensionless Estuary Number 

$$\text{fx } Fr = \sqrt{\frac{E \cdot Q_r \cdot T}{P}}$$

Open Calculator 

$$\text{ex } 10.00012 = \sqrt{\frac{6.154 \cdot 5\text{m}^3/\text{s} \cdot 130\text{s}}{40\text{m}^3}}$$

11) Mixing Parameter 

$$\text{fx } M = \frac{Q_r \cdot T}{P}$$

Open Calculator 

$$\text{ex } 16.25 = \frac{5\text{m}^3/\text{s} \cdot 130\text{s}}{40\text{m}^3}$$

12) Mixing Parameter given Dimensionless Estuary Number 

$$\text{fx } M = \frac{Fr^2}{E}$$

Open Calculator 

$$\text{ex } 16.24959 = \frac{(10)^2}{6.154}$$

13) Rate of Energy Dissipation given Dimensionless Stratification Number 

$$\text{fx } r = n \cdot p$$

Open Calculator 

$$\text{ex } 45 = 2.5 \cdot 18$$

14) Rate of Potential Energy Gain given Dimensionless Stratification Number 

$$\text{fx } p = \frac{r}{n}$$

Open Calculator 

$$\text{ex } 18 = \frac{45}{2.5}$$



15) Salinity at Moment of Slack Water 

$$fx \quad S_s = S \cdot \exp\left(-\left(18 \cdot 10^{-6}\right) \cdot Q_r \cdot x^2 - \left(0.045 \cdot Q_r^{0.5}\right)\right)$$

[Open Calculator !\[\]\(e2376d476d06eb31946dc01a69a4403a_img.jpg\)](#)

ex


$$0.029366 = 33.33\text{mg/L} \cdot \exp\left(-\left(18 \cdot 10^{-6}\right) \cdot 5\text{m}^3/\text{s} \cdot (17\text{m})^2 - \left(0.045 \cdot (5\text{m}^3/\text{s})^{0.5}\right)\right)$$

16) Tidal Period given Mixing Parameter 

$$fx \quad T = \frac{M \cdot P}{Q_r}$$

[Open Calculator !\[\]\(8bba887393ca45b761e5cb49e755e762_img.jpg\)](#)

$$ex \quad 130\text{s} = \frac{16.25 \cdot 40\text{m}^3}{5\text{m}^3/\text{s}}$$

17) Tide Period given Dimensionless Estuary number 

$$fx \quad T = \frac{P \cdot Fr^2}{E \cdot Q_r}$$

[Open Calculator !\[\]\(0fb13ad0bfa3d86868cdd3883e5665b3_img.jpg\)](#)

$$ex \quad 129.9968\text{s} = \frac{40\text{m}^3 \cdot (10)^2}{6.154 \cdot 5\text{m}^3/\text{s}}$$


18) Volume of Tidal Prism given Dimensionless Estuary Number 

$$fx \quad P = \frac{E \cdot Q_r \cdot T}{Fr^2}$$

[Open Calculator !\[\]\(e50091943b385fe16d3277389202856f_img.jpg\)](#)

$$ex \quad 40.001\text{m}^3 = \frac{6.154 \cdot 5\text{m}^3/\text{s} \cdot 130\text{s}}{(10)^2}$$



19) Volume of Tidal Prism given Mixing Parameter [Open Calculator](#) 

$$\text{fx } P = \frac{Q_r \cdot T}{M}$$

$$\text{ex } 40\text{m}^3 = \frac{5\text{m}^3/\text{s} \cdot 130\text{s}}{16.25}$$








Variables Used

- **B** Distance Outside the Estuary (*Meter*)
- **D** Apparent Dispersion Coefficient
- **D₀** Diffusion Coefficient at $x=0$
- **E** Estuary Number
- **Fr** Froude Number
- **M** Mixing Parameter
- **n** Stratification Number
- **p** Rate of Potential Energy Gain
- **P** Volume of Tidal Prism (*Cubic Meter*)
- **Q_r** Fresh Water River Flow (*Cubic Meter per Second*)
- **r** Rate of Energy Dissipation
- **S** Salinity of Water (*Milligram per Liter*)
- **Ss** Salinity at the Moment of Slack Water
- **T** Tidal Period (*Second*)
- **x** Coordinate along the Channel (*Meter*)



Constants, Functions, Measurements used

- **Function: exp**, $\exp(\text{Number})$
n an exponential function, the value of the function changes by a constant factor for every unit change in the independent variable.
- **Function: sqrt**, $\text{sqrt}(\text{Number})$
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: Length** in Meter (m)
Length Unit Conversion 
- **Measurement: Time** in Second (s)
Time Unit Conversion 
- **Measurement: Volume** in Cubic Meter (m^3)
Volume Unit Conversion 
- **Measurement: Volumetric Flow Rate** in Cubic Meter per Second (m^3/s)
Volumetric Flow Rate Unit Conversion 
- **Measurement: Density** in Milligram per Liter (mg/L)
Density Unit Conversion 



Check other formula lists

- [Salinity Variations with Tide Formulas](#) 

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