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Energy Flux Method Formulas

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List of 13 Energy Flux Method Formulas

Energy Flux Method

1) Energy Dissipation Rate by Battjes and Janssen

Open Calculator

fx $$\delta = 0.25 \cdot \rho_{water} \cdot [g] \cdot Q_B \cdot f_m \cdot \left(H_{max}^2\right)$$

ex $$19221.03 = 0.25 \cdot 1000 kg/m^3 \cdot [g] \cdot 2 \cdot 8 Hz \cdot \left((0.7 m)^2\right)$$

2) Energy Dissipation Rate per unit Surface Area due to Wave Breaking

Open Calculator

fx $$\delta = \left(\frac{K_d}{d}\right) \cdot \left(\left(E'' \cdot C_g\right) - \left(E_f\right)\right)$$

ex $$18376.33 = \left(\frac{10.15}{1.05 m}\right) \cdot \left((20.00 J/m^2 \cdot 100 m/s) - (99.00)\right)$$

3) Energy Flux associated with Stable Wave Height

Open Calculator

fx $$E_{f'} = E'' \cdot C_g$$

ex $$2000 = 20.00 J/m^2 \cdot 100 m/s$$

4) Maximum Wave Height given Energy Dissipation Rate

Open Calculator

$$H_{max} = \sqrt{\frac{\delta}{0.25 \cdot \rho_{water} \cdot [g] \cdot Q_B \cdot f_m}}$$

$$0.699999\text{m} = \sqrt{\frac{19221}{0.25 \cdot 1000\text{kg/m}^3 \cdot [g] \cdot 2 \cdot 8\text{Hz}}}$$

5) Maximum Wave Height using Miche Criterion

Open Calculator

$$H_{max} = 0.14 \cdot \lambda \cdot \tanh(d \cdot k)$$

$$0.776538\text{m} = 0.14 \cdot 26.8\text{m} \cdot \tanh(1.05\text{m} \cdot 0.2)$$

6) Mean Wave Frequency given Energy Dissipation Rate

Open Calculator

$$f_m = \frac{\delta}{0.25 \cdot \rho_{water} \cdot [g] \cdot Q_B \cdot H_{max}^2}$$

$$7.999986\text{Hz} = \frac{19221}{0.25 \cdot 1000\text{kg/m}^3 \cdot [g] \cdot 2 \cdot (0.7\text{m})^2}$$

7) Percentage of Waves Breaking given Energy Dissipation Rate

Open Calculator

$$Q_B = \frac{\delta}{0.25 \cdot \rho_{water} \cdot [g] \cdot f_m \cdot \left(H_{max}^2\right)}$$

$$1.999996 = \frac{19221}{0.25 \cdot 1000\text{kg/m}^3 \cdot [g] \cdot 8\text{Hz} \cdot \left((0.7\text{m})^2\right)}$$

8) Stable Wave Height

Open Calculator

fx $$H_{stable} = 0.4 \cdot d$$

ex $$0.42m = 0.4 \cdot 1.05m$$

9) Water Depth given Energy Dissipation Rate per unit Surface Area due to Wave Breaking

Open Calculator

fx $$d = K_d \cdot \frac{E'' \cdot C_g - (E_f)}{\delta}$$

ex $$1.003858m = 10.15 \cdot \frac{20.00J/m^2 \cdot 100m/s - (99.00)}{19221}$$

10) Water Depth given Maximum Wave Height by Miche Criterion

Open Calculator

fx $$d = \left(\frac{a \tanh\left(\frac{H_{max}}{0.14 \cdot \lambda} \right)}{k} \right)$$

ex $$0.943891m = \left(\frac{a \tanh\left(\frac{0.7m}{0.14 \cdot 26.8m} \right)}{0.2} \right)$$

11) Water Depth given Stable Wave Height

Open Calculator

fx $$d = \frac{H_{stable}}{0.4}$$

ex $$1.05m = \frac{0.42m}{0.4}$$

12) Wave Number given Maximum Wave Height by Miche Criterion

Open Calculator

fx $$k = a\frac{\tanh\left(\frac{H_{max}}{0.14\cdot\lambda}\right)}{d}$$

ex $$0.179789 = a\frac{\tanh\left(\frac{0.7m}{0.14\cdot 26.8m}\right)}{1.05m}$$

13) Wavelength given Maximum Wave Height by Miche Criterion

Open Calculator

fx $$\lambda = \frac{H_{max}}{0.14\cdot\tanh(k\cdot d)}$$

ex $$24.1585m = \frac{0.7m}{0.14\cdot\tanh(0.2\cdot 1.05m)}$$

Variables Used

- C_g Wave Group Speed *(Meter per Second)*
- d Water Depth *(Meter)*
- E_f Energy Flux associated with Stable Wave Height
- $E_{f'}$ Energy Flux
- E'' Wave Energy *(Joule per Square Meter)*
- f_m Mean Wave Frequency *(Hertz)*
- H_{max} Maximum Wave Height *(Meter)*
- H_{stable} Stable Wave Height *(Meter)*
- k Wave Number for Waves in Coast
- K_d Decay Coefficient
- Q_B Percentage of Waves Breaking
- δ Energy Dissipation Rate per unit Surface Area
- λ Wavelength of Coast *(Meter)*
- ρ_{water} Water Density *(Kilogram per Cubic Meter)*

Constants, Functions, Measurements used

- Constant: **[g]**, 9.80665
  Gravitational acceleration on Earth
- Function: **atanh**, atanh(Number)
  The inverse hyperbolic tangent function returns the value whose hyperbolic tangent is a number.
- 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.
- Function: **tanh**, tanh(Number)
  The hyperbolic tangent function (tanh) is a function that is defined as the ratio of the hyperbolic sine function (sinh) to the hyperbolic cosine function (cosh).
- Measurement: **Length** in Meter (m)
  Length Unit Conversion
- Measurement: **Speed** in Meter per Second (m/s)
  Speed Unit Conversion
- Measurement: **Frequency** in Hertz (Hz)
  Frequency Unit Conversion
- Measurement: **Heat Density** in Joule per Square Meter (J/m²)
  Heat Density Unit Conversion
- Measurement: **Density** in Kilogram per Cubic Meter (kg/m³)
  Density Unit Conversion

Check other formula lists

- **Breaker Index Formulas**
- **Irregular Waves Formulas**
- **Energy Flux Method Formulas**

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