# Important Design of Flywheel Formulas PDF



Formulas Examples

with Units

List of 21 Important Design of Flywheel Formulas

Evaluate Formula 😭

Evaluate Formula

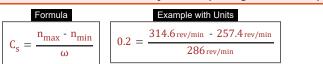
Evaluate Formula 🦳

Evaluate Formula

1) Coefficient of Fluctuation of Flywheel Energy given Maximum Fluctuation of Flywheel Energy Formula

> Formula Example with Units  $C_{e} = \frac{U_{0}}{W}$ 1.93 =  $\frac{791.3}{410}$

2) Coefficient of Fluctuation of Flywheel Speed given Mean Speed Formula 🕝



3) Coefficient of Fluctuation of Flywheel Speed given Min and Max Speed Formula 🕝 👘

Formula	Example with Units
$n_{max} - n_{min}$	$0.2 = 2 \cdot \frac{314.6  \text{rev/min} - 257.4  \text{rev/min}}{257.4  \text{rev/min}}$
$n_{max} + n_{min}$	0.2 = 2 + 314.6 rev/min + 257.4 rev/min

4) Coefficient of Steadiness of Flywheel given Mean Speed Formula 🗹

Formula	Example with Units
$m = \frac{\omega}{n_{max} - n_{min}}$	$5 = \frac{286 \text{ rev/min}}{314.6 \text{ rev/min} - 257.4 \text{ rev/min}}$

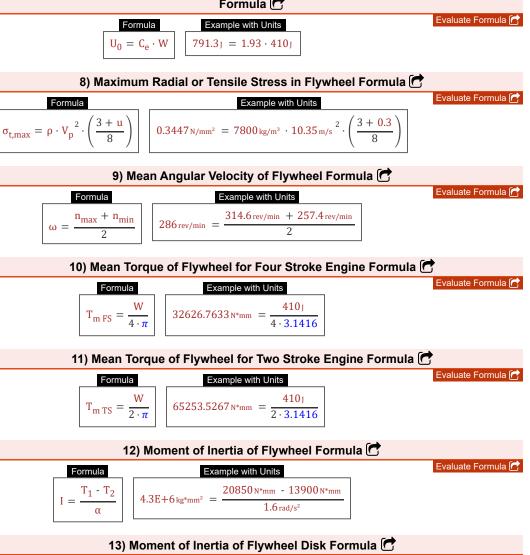


6) Mass Density of Flywheel Disk Formula ि





# 7) Maximum Fluctuation of Flywheel Energy given Coefficient of Fluctuation of Enaergy Formula 🕝



FormulaExample with UnitsEvaluate FormulaI = 
$$\frac{\pi}{2} \cdot \rho \cdot R^4 \cdot t$$
4.3E+6 kg\*mm² =  $\frac{3.1416}{2} \cdot 7800$  kg/m³  $\cdot 345$  mm  $^4 \cdot 25.02499$  mmEvaluate Formula

14) Outer Radius of Flywheel Disk FormulaFormulaExample with UnitsR =  $\left(\frac{2 \cdot I}{\pi \cdot t \cdot \rho}\right)^{\frac{1}{4}}$ 345 mm =  $\left(\frac{2 \cdot 4343750 \, \text{kg*mm}^2}{3.1416 \cdot 25.02499 \, \text{mm} \cdot 7800 \, \text{kg/m}^3}\right)^{\frac{1}{4}}$ 



15) Radial Stress in Rotating Flywheel at given Radius Formula 🕝

Formula

$$\sigma_{\rm r} = \rho \cdot {V_{\rm p}}^2 \cdot \left(\frac{3+{\rm u}}{8}\right) \cdot \left(1 - \left(\frac{{\rm r}}{{\rm R}}\right)^2\right)$$

$$0.2288 \,\text{N/mm}^2 = 7800 \,\text{kg/m}^3 \cdot 10.35 \,\text{m/s}^2 \cdot \left(\frac{3+0.3}{8}\right) \cdot \left(1 - \left(\frac{200 \,\text{mm}}{345 \,\text{mm}}\right)^2\right)$$

16) Tangential Stress in Rotating Flywheel at given Radius Formula 🕝

Formula  
$$\sigma_{t} = \rho \cdot V_{p}^{2} \cdot \frac{u+3}{8} \cdot \left(1 \cdot \left(\frac{3 \cdot u+1}{u+3}\right) \cdot \left(\frac{r}{R}\right)^{2}\right)$$

Example with Units

$$0.278 \, \text{N/mm}^2 = 7800 \, \text{kg/m}^3 \cdot 10.35 \, \text{m/s}^2 \cdot \frac{0.3 + 3}{8} \cdot \left( 1 - \left( \frac{3 \cdot 0.3 + 1}{0.3 + 3} \right) \cdot \left( \frac{200 \, \text{mm}}{345 \, \text{mm}} \right)^2 \right)$$

17) Tensile Stress in Spokes of Rimmed Flywheel FormulaFormulaEvaluate FormulaFormulaExample with UnitsEvaluate Formula=
$$\frac{P}{b_{rim} \cdot t_r} + \frac{6 \cdot M}{b_{rim} \cdot t_r^2}$$
 $25 N/mm^2 = \frac{1500 N}{15 mm \cdot 16 mm} + \frac{6 \cdot 12000 N*mm}{15 mm \cdot 16 mm^2}$ Formula

18) Thickness of Flywheel Disk FormulaExample with UnitsEvaluate Formula
$$t = \frac{2 \cdot I}{\pi \cdot \rho \cdot R^4}$$
25.025 mm =  $\frac{2 \cdot 4343750 \, kg^*mm^2}{3.1416 \cdot 7800 \, kg/m^3 \cdot 345 \, mm^4}$ 

19) Work Done per Cycle for Engine connected to Flywheel Formula

Formula Example with Units  

$$W = \frac{U_0}{C_e} \qquad 410 J = \frac{791.3 J}{1.93}$$

20) Work Done per Cycle for Four Stroke Engine connected to Flywheel Formula 🕝

FormulaExample with UnitsEvaluate Formula
$$W = 4 \cdot \pi \cdot T_{m FS}$$
 $410 J = 4 \cdot 3.1416 \cdot 32626.76 N*mm$ 



 $\sigma t_s$ 

Evaluate Formula

Evaluate Formula 🕝

Evaluate Formula

#### 21) Work Done per Cycle for Two Stroke Engine connected to Flywheel Formula 🕝

Formula  $W = 2 \cdot \pi \cdot T_{m TS}$ 

Example with Units  $410J = 2 \cdot 3.1416 \cdot 65253.53 \,\text{N*mm}$  Evaluate Formula



## Variables used in list of Design of Flywheel Formulas above

- brim Width of Rim of Flywheel (Millimeter)
- Ce Coefficient of Fluctuation of Flywheel Energy
- C<sub>s</sub> Coefficient of Fluctuation of Flywheel Speed
- I Moment of Inertia of Flywheel (Kilogram Square Millimeter)
- m Coefficient of Steadiness for Flywheel
- M Bending Moment in Flywheel Spokes (Newton Millimeter)
- n<sub>max</sub> Maximum Angular Speed of Flywheel (Revolution per Minute)
- n<sub>min</sub> Minimum Angular Speed of Flywheel (Revolution per Minute)
- P Tensile Force in Flywheel Rim (Newton)
- **r** Distance from Flywheel Centre (Millimeter)
- R Outer Radius of Flywheel (Millimeter)
- t Thickness of Flywheel (Millimeter)
- T<sub>1</sub> Driving Input Torque of Flywheel (Newton Millimeter)
- T<sub>2</sub> Load Output Torque of Flywheel (Newton Millimeter)
- T<sub>m FS</sub> Mean Torque of Flywheel for Four Stroke Engine (Newton Millimeter)
- T<sub>m TS</sub> Mean Torque of Flywheel for Two Stroke Engine (Newton Millimeter)
- tr Thickness of Rim of Flywheel (Millimeter)
- U Poisson Ratio for Flywheel
- **U**<sub>0</sub> Maximum Fluctuation of Energy for Flywheel (*Joule*)
- Uo Energy Output From Flywheel (Joule)
- V<sub>p</sub> Peripheral Speed of Flywheel (Meter per Second)
- W Work Done per Cycle for Engine (Joule)
- α Angular Acceleration of Flywheel (Radian per Square Second)
- **ρ** Mass Density of Flywheel (*Kilogram per Cubic Meter*)

## Constants, Functions, Measurements used in list of Design of Flywheel Formulas above

- constant(s): pi,
   3.14159265358979323846264338327950288
   Archimedes' constant
- Measurement: Length in Millimeter (mm) Length Unit Conversion
- Measurement: Speed in Meter per Second (m/s) Speed Unit Conversion
- Measurement: Energy in Joule (J) Energy Unit Conversion
- Measurement: Force in Newton (N) Force Unit Conversion
- Measurement: Angular Velocity in Revolution per Minute (rev/min) Angular Velocity Unit Conversion
- Measurement: Density in Kilogram per Cubic Meter (kg/m<sup>3</sup>) Density Unit Conversion
- Measurement: Torque in Newton Millimeter (N\*mm)
   Torque Unit Conversion (C)
- Measurement: Moment of Inertia in Kilogram Square Millimeter (kg\*mm<sup>2</sup>) Moment of Inertia Unit Conversion
- Measurement: Moment of Force in Newton Millimeter (N\*mm) Moment of Force Unit Conversion
- Measurement: Angular Acceleration in Radian per Square Second (rad/s<sup>2</sup>) Angular Acceleration Unit Conversion
- Measurement: Stress in Newton per Square Millimeter (N/mm<sup>2</sup>) Stress Unit Conversion

- σ<sub>r</sub> Radial Stress in Flywheel (Newton per Square Millimeter)
- $\sigma_t$  Tangential Stress in Flywheel (Newton per Square Millimeter)
- +  $\sigma_{t,max}$  Maximum Radial Tensile Stress in Flywheel (Newton per Square Millimeter)
- $\sigma t_s$  Tensile Stress in Spokes of Flywheel (Newton per Square Millimeter)
- ω Mean Angular Speed of Flywheel (Revolution per Minute)



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