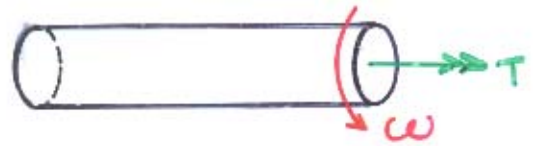


Torsion: Power Transmission

Power Transmission (HP)

Angular Speed (Hz = cycle/sec \approx rpm)
rev/min



T is needed to design the shaft.

From Physics:

$$P = T\omega$$

*SI Units

$$\omega = 2\pi f$$

P = Power (Watt)

ω = angular velocity (rad/sec)

f = frequency of the rotating shaft (Hz = /sec)

T = Torque (N.m)

$$\Rightarrow P = 2\pi f T \quad (\text{N}\cdot\text{m}/\text{s} = \text{Watt})$$

$$1 \text{ Hp} = 745.7 \quad (\text{N}\cdot\text{m}/\text{s})$$

$$\Rightarrow \text{Hp} = \frac{2\pi f T}{745.7} \Rightarrow$$

$$\boxed{\text{Hp} = \frac{fT}{119}}$$

*U.S./English units

$$\omega = 2\pi n$$

n (rpm = rev/min)

T (in-lb)

$$\Rightarrow P = 2\pi n T \quad (\text{in}\cdot\text{lb}/\text{min})$$

$$1 \text{ Hp} = 550 \quad (\text{ft}\cdot\text{lb}/\text{sec})$$

$$\Rightarrow \text{Hp} = \frac{2\pi n T}{550 (12)(60)} \Rightarrow$$

$$\boxed{\text{Hp} = \frac{nT}{63000}}$$

Do NOT

forget

the units

Gears

$$\frac{T_1}{T_2} = \frac{n_2}{n_1}$$



See the Example.