***Calculating a piston's power output using stroke, force on the piston, and angular velocity***

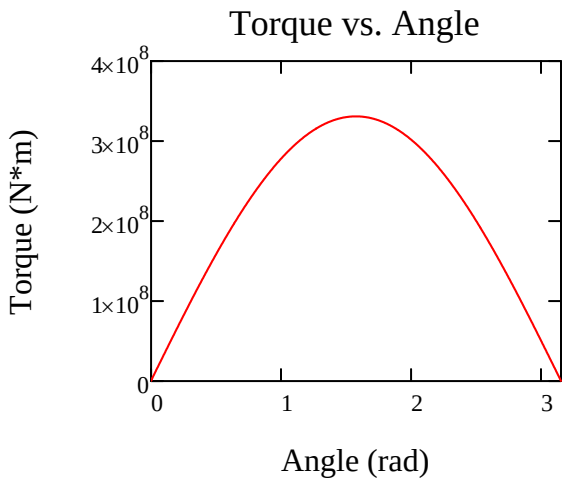
$$\omega := \frac{4\pi\,\text{rad}}{24\text{hr}} = 1.454 \times 10^{-4}\,\frac{\text{rad}}{\text{s}}$$ *2 full revolutions per 24 hours*

$\text{Force} := 27100\text{tonf}$

$\text{Stroke} := 9\text{ft}$ *Force and stroke*

*Calculating torque as a function of crank angle*

$$\text{Torque}(\theta) := \text{Force}\cdot\frac{\text{Stroke}}{2}\cdot\sin(\theta)$$




*Calculate energy per stroke*

$$\text{EnergyPerStroke} := \int_{0\text{rad}}^{\pi\,\text{rad}} \text{Torque}(\theta)\,d\theta = 183.713\,\text{kW}\cdot\text{hr}$$

*Compared to work calculation, Force * Distance*

$\text{Force}\cdot\text{Stroke} = 183.713\,\text{kW}\cdot\text{hr}$

*Calculate power output, calculated as average torque * angular speed*

$$T_{avg} := \frac{1}{\pi - 0}\cdot\int_{0}^{\pi} \text{Torque}(\theta)\,d\theta = 2.105 \times 10^{8}\,\text{N}\cdot\text{m}$$

$\text{Power} := T_{avg}\cdot\omega = 30.619\,\text{kW}$