Answer on Question #69219, Physics / Other

An automobile engine develops 60 kW of power when rotating at a rate of 1200 rpm What torque does it deliver ? Draw diagram.

Solution:

The power of a rotating body can be expressed as

$$P = T\omega = T\,2\pi\,n_{rps} = T\,\pi\,n_{rpm}\,/\,30$$

where

P = power (W)

T = torque or moment (Nm)

ω = angular velocity (rad/s)

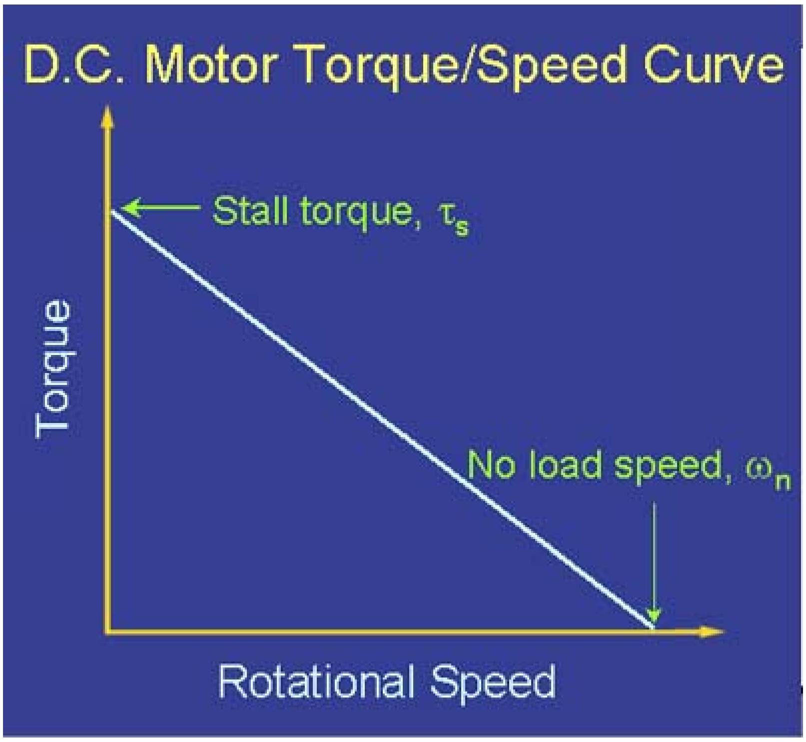
π = 3.14...

n_{rps} *= rotations per second (rps, 1/s)*

n_{rpm} *= rotations per minute (rpm, 1/min)*

Thus,

$$T = \frac{30P}{\pi\,n_{rpm}} = \frac{30\times 60\times 10^3}{\pi\times 1200} = \frac{1500}{\pi} = 477.5\ Nm$$



The graph above shows a torque/speed curve of a typical D.C. motor. Note that torque is inversely proportional to the speed of the output shaft. In other words, there is a tradeoff between how much torque a motor delivers, and how fast the output shaft spins. Motor characteristics are frequently given as two points on this graph:

The stall torque,[Ts], represents the point on the graph at which the torque is a maximum, but the shaft is not rotating.

The no load speed,[ω_n], is the maximum output speed of the motor (when no torque is applied to the output shaft).

Answer: $477.5\ Nm$

Source: http://www.engineeringtoolbox.com/angular-velocity-acceleration-power-torque-d_1397.html