Machines and Mechanical Energy Notes

Note Taking Guide - Episode 604 - Part 1

Mechanical Advantage - ratio of output to input forces

equation: $M.A. = \frac{F_{out}}{F_{in}}$

The greater the M.A. of a machine, the easier it is to operate.

In ideal machines, work input = work output. Real machines are not this efficient.

Efficiency- percentage of useful work produced

equation: $Eff = \frac{W_{out}}{W_{in}} \times 100$

Machines cannot be 100% efficient:

- Work done to overcome friction is changed into heat.
- The heat goes into the surroundings
- Friction is a dissipative force.
- As M.A. increases, the Eff of a machine decreases.
- Loss of efficiency is due to friction.

Problem Set #1 (1a-d): (on back)

Power - work done per unit of time

- $P = \frac{W}{t}$
- Unit = the watt (W) 1 W = 1 Watt
- 1 W = 1 J/s
- $P = \frac{W}{t} = \frac{F \cdot d}{t}$

A box weighing 580 N is lifted 22 m straight up in 15 s by a machine. What is the power of the machine?

$F_W = 580\ N$
$d_{out} = 22\ m$
$\Delta t = 15\ s$
$P = ?$

$$P = \frac{W}{\Delta t} = \frac{580\ N \cdot 22\ m}{15\ s} = 850\ W$$