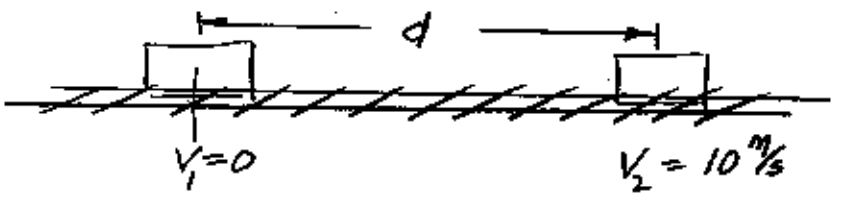
? Avg. Power

$$\text{POWER} = \frac{\text{WORK}}{\text{TIME}} = \frac{Fd}{t}$$

$$\text{WORK} = \Delta KE$$

or $PE_1 - PE_2 = KE_2 - KE_1$



GIVEN

DIESEL ENGINE TRAIN

$m = 400 \times 10^6\ g$

$V_i = 0$ REST

$V_f = 10\ m/s$

$\Delta t = 100\ s$

$$\text{WORK} = \Delta KE = \frac{1}{2} m \left[V_2^2 - V_1^2\right] = \frac{400 \times 10^3\ kg}{2} \left[10 \frac{m}{s}\right]^2$$

$$\frac{\text{WORK}}{t} = \frac{2 \times 10^7\ N\text{-}m}{100\ s} = 2 \times 10^5 = 200 \frac{kN\text{-}m}{s}$$

$$\boxed{\text{POWER} = 200\ kW}$$

$$\text{Watt} = \frac{Nm}{s}$$

By NEWTON'S 2nd LAW, $\Sigma \vec{F}_x = m\vec{a}_x$?

HORIZONTAL

$$V_f = V_0 + at$$

$$\frac{(10\ m/s - 0)}{100\ s} = a = 0.1 \frac{m}{s^2}$$

$$\therefore F = ma = (400 \times 10^3\ kg)(0.1 \frac{m}{s^2}) = 40\ kN$$

$$\text{POWER} = \frac{Fd}{t} = F\left(\frac{d}{t}\right) = F V_{avg.} = F\left[\frac{V_2 - V_1}{2}\right]$$

$$= 40\ kN \left[\frac{10\ m/s - 0}{2}\right] = 200 \frac{kN m}{s} = 200\ kW$$