Answer on Question #68497 – Physics – Mechanics | Relativity

A dock side container crane can lift a fully loaded container of mas $37000\ kg$ from rest to a maximum velocity of $1.2\ ms^{-1}$ in a distance of $8\ m$. if the friction ristance of the crane winch gear is $2\ kN$ and asuming the accleration is inform determain using the princible of convertation of energy:

i. work done

ii. the tension in the lifting cable

iii. the maximum power developed

Solution.

We find the acceleration of the container:

$$a = \frac{v^2 - {v_0}^2}{2s} = \frac{1.2^2 - 0}{2 * 8} = \frac{1.44}{16} = 0.09\ ms^{-2};$$

The Newton's second law for the motion of a container (in projection on the vertical y-axis):

$\mathrm{m} * \mathrm{a} = F_1 - mg;$ F_1 is the tension in the lifting cable

$$F_1 = m(a + g) = 37000 * (9.81 + 0.09) = 366300\ N \approx 366\ kN;$$

We find the maximum power developed using the principle of conservation of energy.

$P = F * v = (F_1 + F_2) * v = (366300 + 2000) * 1.2 = 441960\ W \approx 442\ kW;$ F_2 is the friction ristance of the crane.

Answer:

ii. $F_1 \approx 366\ kN;$

iii. $P \approx 442\ kW$