Fluid Mechanics with Student Resources DVD (2nd Edition)

Chapter 1, Problem 38P | 1 Bookmark | Show all steps: ON

Problem

A forklift raises a 90.5 kg crate 1.80 m. (*a*) Showing all your work and using unity conversion ratios, calculate the work done by the forklift on the crane, in units of kJ. (*b*) If it takes 12.3 seconds to lift the crate, calculate the useful power supplied to the crate in kilowatts.

Step-by-step solution

Step 1 of 3

(a) Calculate the work done by the fork lift on the crate using the following relation:

$W = F \times s$ ..... (1)

The force acting on the crate is equal to the weight of the crate. Hence, the force acting on the crate is determined using the following relation:

$F = mg$

Substitute $90.5\ \text{kg}$ for m and $9.81\ \text{m/s}^2$ for g.

$$F = 90.5 \times 9.81$$
$$= 887.805\ \text{N}$$

Here, F is the force acting on the crate, s is the height up to which the crate is lifted, W is the work done by the fork lift, m is the mass of the crate and g is the acceleration due to gravity

Comment

Step 2 of 3

Substitute $887.805\ \text{N}$ for F and $1.80\ \text{m}$ for s in equation (1)

$$W = F \times s$$
$$= 887.805 \times 1.80$$
$$= 1598.05\ \text{J}$$
$$\approx 1600\ \text{J}$$

Therefore the work done by the fork lift on the crate is $\boxed{1600\ \text{J}}$.

Comment

Step 3 of 3

(b) Calculate the useful power supplied to the crate using the following relation:

$P = \frac{W}{t}$ ..... (2)

Here, P is the power supplied and t is the time taken to lift the crate.

$$= \frac{1600\ \text{J}}{12.3\ \text{s}}$$
$$= 130\ \text{W}$$
$$= 0.13\ \text{kW}$$

Therefore the useful power supplied to the crate is $\boxed{0.13\ \text{kW}}$.

Comment

Was this solution helpful? 15 0

Recommended solutions for you in Chapter 1

Chapter 1, Problem 5P

How is the Mach number of a flow defined? What does a Mach number of 2 indicate?

See solution

Chapter 1, Problem 38P

A forklift raises a 90.5 kg crate 1.80 m. (a) Showing all your work and using unity conversion ratios, calculate the work done...

See solution

See more problems in subjects you study