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# Fluid Mechanics with Student Resources DVD (2nd Edition)

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**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:

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

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 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

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**Step 2 of 3**

Substitute 887.805 N for  $F$  and 1.80 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 1600 J.

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**Step 3 of 3**

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

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

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

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$$\begin{aligned} & t \\ &= \frac{1600 \text{ J}}{12.3 \text{ s}} \\ &= 130 \text{ W} \\ &= 0.13 \text{ kW} \end{aligned}$$

Therefore the useful power supplied to the crate is **0.13 kW**.

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