Answer on Question #55930-Physics-Classical Mechanics

The blades of a wind mill sweep out a circle of area A. If wind flows with velocity v perpendicular to blades of wind mill and its density is D, then the mechanical power received by wind mill is

(a) (DAv^3)/2

(b) DAv^3

(c) (DAv^2)/2

(d) 2DAv^2

Solution

The mass of air is

$$m = D \cdot V = DAvt.$$

The kinetic energy is

$$K = \frac{1}{2}mv^2 = \frac{1}{2}DAvtv^2 = \frac{1}{2}DAtv^3.$$

The mechanical power received by wind mill is

$$P = \frac{K}{t} = \frac{1}{2}DAv^3$$

Answer: (a) (DAv^3)/2.