

Power



Power

In many cases it is useful to know how rapidly is done the work.

We define power as the time rate of doing work:

$$\text{Power} = \frac{\text{Work done}}{\text{Time needed to do the work}}$$

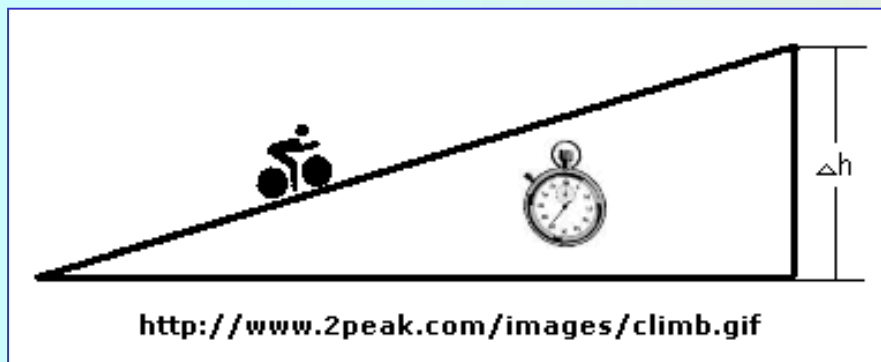
$$P = \frac{W}{t}$$

Units

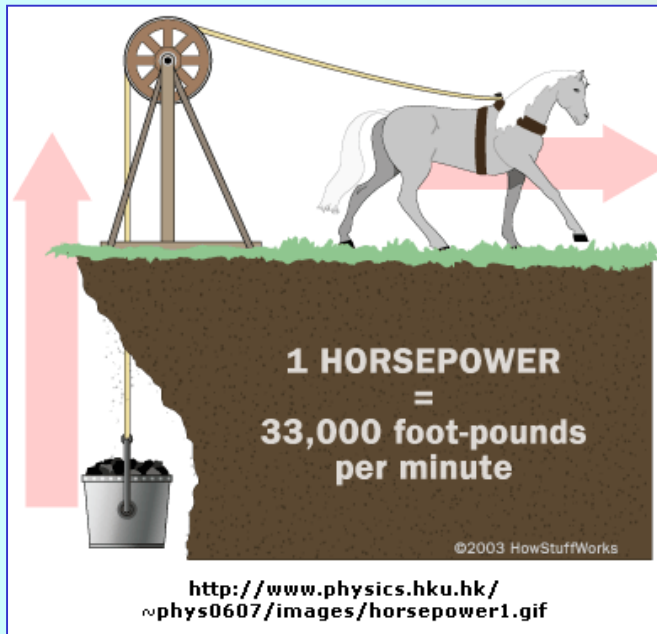
In SI units, work is measured in joules (J) and time in seconds. The unit power is the joule/second, a combination that has been given the name watt (abbreviated W):

$$1 \text{ watt (W)} = 1 \frac{\text{joule (J)}}{\text{second (s)}}$$

$$1 \text{ W} = 1 \frac{\text{J}}{\text{s}}$$



Power



Units

James Watt (1736-1819) made systematic measurements on the work a horse could perform in a given time. From those measurements, he established the relationship between the units watt (W) and horsepower (HP):

$$1 \text{ horsepower (HP)} = 736 \text{ W} = 736 \frac{\text{joule (J)}}{\text{second (s)}}$$



[http://pictopia.com/perl/get_image?provider_id=367&size=550x550
_mb&ptp_photo_id=559684](http://pictopia.com/perl/get_image?provider_id=367&size=550x550_mb&ptp_photo_id=559684)

Power



<http://pro.corbis.com/images/42-16613541.jpg>
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<http://www.nd.edu.au/images/media-releases/20060728JacobsLadder021.jpg>

Exercise #01

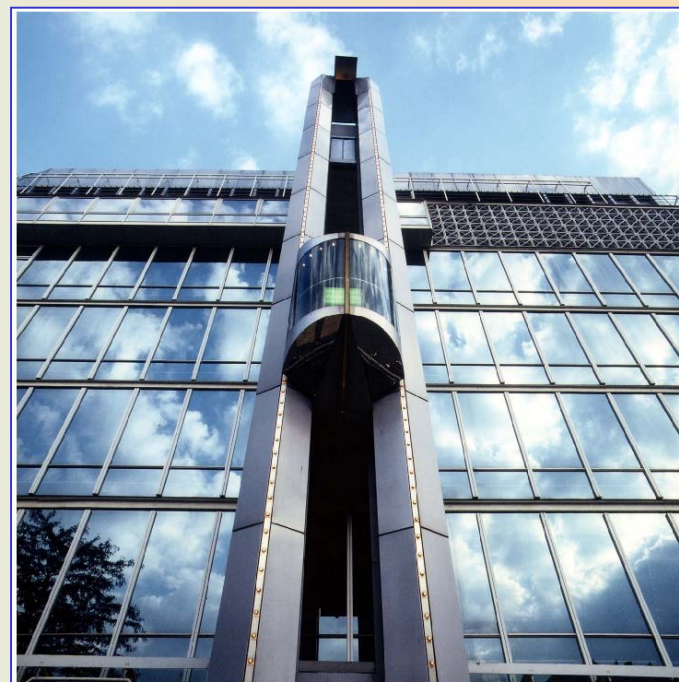
A 70-kg person runs up a staircase 3 m high in 3.5 s. How much power does he develop in climbing the steps?

Sol: 590 W; 0.79 HP

Exercise #02

A 2150-kg loaded elevator moving with constant speed rises 28 m in 15 s. The frictional force with the guide rails is a constant 1534 N. What power is required?

Sol: 42 kW



http://www.thyssenkrupp.com/ml/pb/bilder/107/TA_03.jpg