Example: Water pump efficiency

Calculate the pump’s efficiency for a small irrigation pump, such as a sprinkler pump of 1 HP with the following specs (e.g., [Flotec Thermoplastic Sprinkler Pump 1 HP](https://www.globalindustrial.com/p/plumbing/pumps/clean-water-pumps/thermoplastic-sprinkler-pump-1-hp?infoParam.campaignId=T9F&gclid=CjwKCAiAlL_UBRBoEiwAXKgW50RJaYWnsPK7EPBPk9QNb_AG8IziO27d9pqQhhlVg7K8RL0ZDke10BoCrMsQAvD_BwE)):

 Horsepower 1

Gallons Per Minute (GPM) 55

Best for use at maximum depth of <20' or 6m



Units & Unit Conversions involved:

1 Ga = 3.79 L

Mass of one liter of water; ml = 1 kg

Mass of 1 gallon of water; mg = 3.79 kg

Watts ≡ kg. m2 / s3

= 3.34 GPS = 200.85 GPM (this is Gallon per minute assuming 100 % efficiency

Calculated Water Pump efficiency

[SumpMarine UTP](https://www.amazon.com/dp/B06XC615GC/ref%3Dsspa_dk_detail_2?psc=1&pd_rd_i=B06XC615GC&pd_rd_wg=tR6Qm&pd_rd_r=MYVSFMBB97WZ62257HYP&pd_rd_w=sbnpU) 115-Volt 330 GPH Portable Transfer Water Pump, Bronze

[Fpower Portable Transfer Water Pump Battery Powered](https://www.amazon.com/dp/B073QQMVL1/ref%3Dsspa_dk_detail_0?psc=1&pd_rd_i=B073QQMVL1&pd_rd_wg=LguxJ&pd_rd_r=YSTW7CHFMSC1TFPDC3G9&pd_rd_w=O3cgX) Self-Priming Pump -12V, 300 GPH, 3/4" Garden Hose

Example: Water Pump Power

A water pump system must be able to raise 8 gallons of water every minutes up to a height of 10 m (pumping water from 10 m underground water source to the ground level). The density of the water is 1.04 g/cm3, due to the minerals in the water.

1. What is the work done to lift one liter of the water?
2. What is the operating power of the water pump, assuming its efficiency is rated as 23.5 %?

Density

 m = 1.04 kg

 F = mg = (1.04 kg) (-9.8 m/s2) = -10.2 N

Therefore; W = (10.2 N) (10 m) = 102 J Work done to raise one liter of water by 10 m

Volume = 8 Gallons = (8 Gallons)

The work done to move 8 gallons or 45.48 l of water is then = (102 J) (30.32) = 3092.6 J

Leading to

Assuming 23.0% efficiency for the water pumping system the electric power needed to run the pump is;

Example: Water Pump Operation

Could a 1.0 horsepower (hp) water pump can pump 10 Gallons per minute from a maximum vertical depth of 10m, if the pump efficiency is 50%?



Units & Unit Conversions involved:

1 Ga = 3.79 L

 Mass of one liter of water; ml = 1 kg

 Mass of 1 gallon of water; mg = 3.79 kg

 Watts ≡ kg. m2 / s3

7.61 kg /s

= (7.61 kg/s)(1 Gallon / 3.79 kg)

= 2.00 g/s = 120 g/m assuming a pump with 100% efficiency

= 60 g/m at assuming a pump with 50% efficiency

I psi = 6.894757 kPa

 <https://www.globalspec.com/SpecSearch/SearchForm/flow_control_flow_transfer/pumps/water_pumps>