

Water powered fan



Key words

- Hydraulic energy
- Mechanical energy
- Watermill
- Electricity

The science behind

Introduction :

In the video, we can see that the higher the water falls, the faster the mill turns and the greater the flow, the faster the blades turn. This is how watermills work. Gravity allows the water to fall on our blades and this force makes them turn.

History:

The first mills: the water mills

The oldest hydraulic machine (2500 BC) is the chadouf, a lever with a counterweight, which allows a bucket to be lowered and raised in a well. It is still used today. The mill is thought to derive from the norias, used in the Near East in 2000 BC: large vertical wheels with buckets, driven by an animal and used for irrigation.

It is said that the invention of the water wheel dates from the 3rd century BC, to power the wheat mills of the Eastern Mediterranean. The mechanisms for transmitting movement were then perfected, but did not spread widely in the Roman Empire because of the use of slaves and the irregularity of the waterways... In the 6th century, Belisarius had mills installed on boats on the Tiber to supply the population with flour.

There are two basic types of water mills, one powered by a vertical water wheel via a gear mechanism, and the other with a horizontal water wheel without such a mechanism. The horizontal waterwheel can directly drive the grinding stones mounted on its shaft. The vertical wheel must have a gear mounted on its horizontal axis, to transmit the movement to the grinding wheel whose axis is vertical. At first the water pushed the blades from below. Then it was channelled through a reach onto the blades or buckets.

Watermill use:

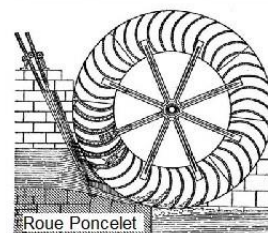
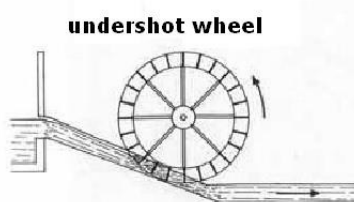
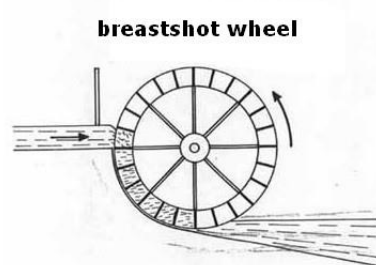
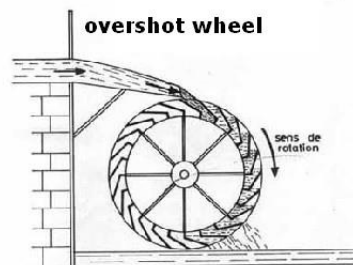
To make paper



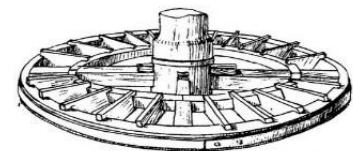
To make flour



Vertical wheels



Horizontal wheels



bucket wheel (moulin à trompe)



paddle wheel (moulin à cuve)

Explanation of the phenomenon :

a) Gravity force

Mill wheels are powered by gravity and the speed of the current. By conducting the water over the wheel, the falling water transmits its energy to the wheel; the use of bucket wheels allows for a higher efficiency.

b) Hydroelectric power

Hydropower is the energy provided by the movement of water, in all its forms: waterfalls, rivers, sea currents, tides, waves. This movement can be used directly, for example with a water mill, or more commonly be converted, for example into electrical energy in a hydroelectric power station.

Energy is the ability of a person or object to do work or cause a change.

The wheel, driven by the flow of water at the entrance to the mill, transforms the hydraulic energy into mechanical energy. This mechanical energy, transmitted by the turbine shaft, drives the alternator which produces electricity. The electricity produced in this way will be transmitted to the consumers via the electricity network.

It is an energy that does not emit greenhouse gases, it can be used quickly thanks to the large quantities of stored water and it is a very economical renewable energy in the long term.

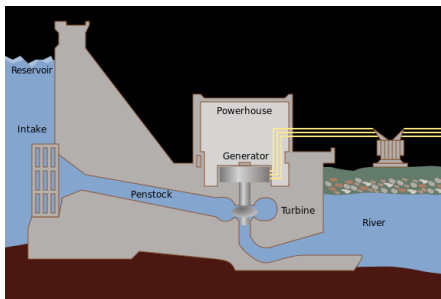
Every day life

There are several types of hydroelectric power plants in the world today:

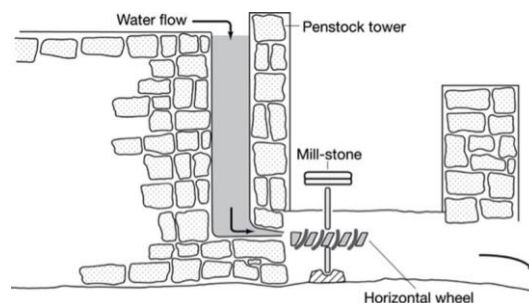
- Hydroelectric power plant that uses a dam
- Run-of-the-river hydroelectric power plant
- Pumped storage plant

The hidrolic force can also be used in:

- The tidal plant
- watermill



Hydroelectric dam



Watermill exemple