

Hydro power

All over history, people used this kind of energy to perform activities such as grinding, or forging, or treating linen before spinning. Everybody knows that our rivers and streams are full of small mills, most of them are in ruins, and these facilities are the reflection of the sustainable use of the riverbeds. Nowadays the energy of the rivers, is divided into:

- Small-scale hydroelectric: They are the small power plants that do not imply big interactions with the riverbeds.
- Large-scale hydroelectric: Power plants that always build a big dam in the riverbed.

Hydraulic energy is the one produced by the fall of water from a certain height to a lower level or the one produced by the movement of hydraulic wheels or turbines. Hydro power is a natural resource available in those areas with enough levels of water. It requires reservoir and dam building, and by-pass passages. This implies a huge economic investment, therefore it wouldn't be competitive in those areas where oil or coal are cheap, even though the maintenance cost of a steam power plant, due to fuel, is more expensive than the one of a hydroelectric power plant. The power obtained through hydraulic resources depends on the volume of water that flows per time unit and on the head. A hydroelectric plant consists of a set of facilities that will transform the kinetic and potential energy of water into useful energy, such as electricity. This transformation is made through the action of water on a hydraulic turbine, that provides rotatory movement to an electric generator. How does a hydroelectric power plant work? The Hydroelectric plants depend on a huge reservoir restrained by a dam. The flow of water can be controlled and kept continuous. Water is transported through channels controlled by valves and turbines to adapt the flow of water according to power demands. The water that gets into the turbine gets out by tail races. The generators are situated just over the turbines and they are connected through vertical shafts. The design of the turbines depends on the flow of water: Francis and Kaplan turbines are used for big flows and medium and low head sites and Pelton turbines are used for big high head sites and small flows. Hydraulic turbines are used to use the energy of flowing water. Kaplan turbine is similar to a ship's propeller. The wide blades of the turbine are propelled by high pressure water coming from a lock gate. Pelton turbine is a XIXth century model and its structure is more similar to that of a traditional water mill. The wheel turns when the channelled water presses its spoon-shaped buckets or blades. In order to create a water head it is necessary to raise the superficial level of water over the normal level of the flow. This is done by creating a dam, so that a head is created to be used at the reservoir or it can be done by channelling water through a by-pass passage with less pitch than the riverbed. The water at the by-pass passage must be conducted to the turbines and in order to do that, in heads lower than 12 m water flows directly at the turbine room, and in heads higher than 12m water flow ends into a stretched channel named pressure chamber. After, pressured channelled water flow will bring water to the turbines through penstock. Water flows under high pressures through the pipeline and it propels the blades, that spins an axle and the generator. At the exit of the turbine room, water is driven through an outlet channel back into the river.

Advantages: It is an inexhaustible resource that depends on water cycles. It doesn't produce any greenhouse effect gases nor acid rain. It is not necessary to use refrigeration systems nor boilers. It stores water to be used in irrigation. It regulates the water flow, thus avoiding floods. Birds can inhabit the artificial reservoirs.

Disadvantages: Reservoirs stand in the way of many fish species when they go upriver for spawning. Water in reservoirs doesn't have the same salinity, gas rates, temperature, nutrients and other properties as the water flowing through the river. Sediments deposit at the bottom of the reservoir and impoverishes the quality of water and nutrients of the rest of the river. Dam building causes moving whole towns. It causes a deterioration in the whole environment. There is also the implicit danger of dam breaking and the consequent flooding of neighbour areas. There is a change in climate: increase of humidity levels, clouds and rainfalls.