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Hydropower

Hydropower or water power is power derived from the energy of falling water and running water , which may be harnessed for useful purposes. Since ancient times, hydropower has been used for irrigation and the operation of various mechanical devices, such as watermills, sawmills, textile mills, dock cranes, domestic lifts, power houses and paint making.

Since the early 20th century, the term has been used almost exclusively in conjunction with the modern development of hydroelectric power, which allowed use of distant energy sources. Another method used to transmit energy used a trompe, which produces compressed air from falling water. Compressed air could then be piped to power other machinery at a distance from the waterfall.

Water's power is manifested in hydrology, by the forces of water on the riverbed and banks of a river. When a river is in flood, it is at its most powerful, and moves the greatest amount of sediment. This higher force results in the removal of sediment and other material from the riverbed and banks of the river, locally causing erosion, transport and, with lower flow, sedimentation downstream.

Having fallen out of favor during the late 20th century due to the disruptive ecological and social effects of large impoundments, hydropower enjoyed a revival by 2013 as international institutions such as the World Bank tried to find solutions to economic development which avoided adding substantial amounts of carbon to the atmosphere. Broad categories include:

- Conventional hydroelectric, referring to hydroelectric dams.
- Run-of-the-river hydroelectricity, which captures the kinetic energy in rivers or streams, without the use of dams.

- Small hydro projects are 10 megawatts or less and often have no artificial reservoirs.
- Micro hydro projects provide a few kilowatts to a few hundred kilowatts to isolated homes, villages, or small industries.
- Conduit hydroelectricity projects utilize water which has already been diverted for use elsewhere; in a municipal water system for example.
- Pumped-storage hydroelectricity stores water pumped during periods of low demand to be released for generation when demand is high.

The economics – cost reduction

Normally, small-scale hydro installations in rural areas of developing countries can offer considerable financial benefits to the communities served, particularly where careful planning identifies income-generating uses for the power. The major cost of a scheme is for site preparation and the capital cost of equipment. In general, unit cost decreases wit a larger plant and with high heads of water. It could be argued that small-scale hydro technology does not bring with it the advantages of 'economy of scale', but many costs normally associated with larger hydro schemes have been 'designed out' or 'planned out' of micro hydro systems to bring the unit cost in line with bigger schemes.

This includes such innovations as:

• using run-of-the-river schemes where possible - this does away with the cost of an expensive dam for water storage

• locally manufactured equipment where possible and appropriate

• use of HDPE penstocks where appropriate

• electronic load controller – allows the power plant to be left unattended, thereby reducing labour costs, and introduce useful by – products such as battery charging or water heating as dump loads for surplus power

• using existing infrastructure, for example, a canal which serves an irrigation scheme

• siting of power close to village to avoid expensive high voltage distribution equipment such as transformers

• using pumps as turbines (PAT) - in some circumstances standard pumps can be used 'in reverse' as turbines

• using motors as generators - as with the PAT idea, motors can be run 'in reverse' and used as generators

• use of local materials for the civil works

• use of community labour

• good planning for a high plant factor and well balanced load pattern

In recent years there has been much debate over the appropriate scale of hydro power. Many argue that large hydro is not only environmentally damaging but that there is also a negative social impact where large imported technologies are used.

Literature:

1. Micro-hydro power, Adam Harvey, 2004, Intermediate Technology Development Group.
2. "Hydroelectric Power". Water Encyclopedia.
3. http://en.wikipedia.org/wiki/Hydropower