DEVELOPMENT OF A SMALL HYDRO POWER PROJECT IN HIMALAYAS - AN EXPERIENCE, A THRILL AND A JOY

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THE HISTORY OF WATER POWER

The Persians used a wheel to raise water from a river to higher place. It was called the saqia.

250 BC water power was used as a clock.

The Antipater of Thessalonica during 80 BC wrote, "Cease your work, ye maids who labour at the mill . . . for Ceres has commanded the water-nymphs to perform your task." The work of grinding grains such as corn was automated by water power.

Water mills became popular by the Saxons in England around 762 AD. A millwright traveled the countryside and fixed broken mills. Millwrights were important occupations during the Norman Conquest.

The Domesday survey of 1086 found there were more than 5000 mills.

In the fifteenth century iron works exploited the power of the water to cool the blast furnace. In Sheffield and Sussex, England iron works were employed next to the water.

In the sixteenth and seventeenth centuries the upper classes treasured complex water powered devices. Fountains and statues moved, and organs played; all powered by water.

In 1581 Peter Morise installed a water wheel under the old London Bridge. It worked on the ebb and flood tides, meaning it was reversible. This aparatus was partially destroyed by the Fire of London in 1666, but some survived until 1822, a few years before the present London Bridge was built to replace the old one.

The Industrial Revolution was largely supported by textile mills powered by water.

During 1824 the Catrine cotton mill used a water wheel and through gearing shafting and belting achieved 9000 revolutions per minute!

28 Tide mills existed in England in 1838 even though the era of steam engines was beckoning. Compare the steam engine history on the nuclear power timeline.

The transmission of hydroelectric power was demonstrated at the Exposition in Munich of 1882. With direct current of 2400 volts the power was transmitted from Miesbach, 37 miles away.

The first central hydroelectric station of a capacity of 250 lights was installed in Appleton, Wisconsin in 1882

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In 1885, also in Ireland a 65 horsepower turbine was opened for the Bessbrook and Newry railway.

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At the turn of the nineteenth century Oliver Evans developed a completely water powered mill that handled everything from unloading sacks of grain to packing flour in turbines.

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The first of its kind, a hydro-electric plant, was developed in 1883 at Portrush in Ireland.

The Himalayan Range in India has a vast Potential for Hydro Power, which includes Major Hydro, Small Hydro and Micro hydro.

As per an estimate the Total Potential of the Himalayan States of India is 1,30,000 MW..

It is imperative that looking into the present Power Scenario in the Country, all the possible sources of the Energy are tapped to the maximum and that too in the shortest possible time period as the Gap between the Demand and Supply for the Power is increasing Day by Day.

In case of Hydro Power the Development of Major Hydro Project consumes the maximum time due to Environment and Social issues, but in case of Small Hydro Power the Project can be developed very fast and it can add to the availability of the Power in the National Grid.

OUR EXPERINCE OF DEVELOPMENT OF A SMALL HYDRO POWER PROJECT

We have developed a Small Hydro Power Project of the Capacity of 1.0 MW in Shimla District of Himachal Pradesh.

The reason for going for a small project was to get the Good Idea of the working in Himalayas and this project has given us good experience of the difficulties expected in working in such terrain and how to tackle the same.

The Project

The Ching Small Hydro Power Project is conceived on Rumnu Khad (a tributary of River Pabbar) in Shimal District of the Himachal Pradesh. The Project is 114 Km from Shimla by road.

SAILENT FEATURES

The brief salient features of the project are as under:

Stream	:	Rumnu Khud
Catchment Area	:	19 Sq. Km
Design Discharge	:	0.89 cumecs
Gross Head	:	160 meters
Diversion Weir	:	Raised Crest Weir
Size of Weir	:	8 m long, 1.2 meter deep, 1.2 meter wide
Desilting Arrangement	:	Central Cunette Type
Water Conductor System	:	1375 m long, partially Rectangular Channel, partially MS pipe
Forebay	:	Rectangular Shape, 30m X 4m X 3m
Penstock	:	600 mm Dia Steel pipe 415m Long + 2X350mm Dia 30m long
Design Head	:	145 m
Installed Capacity	:	2 X 500 KW
Tailrace Channel	:	Rectangular
Energy for Sale	:	5.16 MU

RUMNU KHAD

Rumnu Khad is an important tributary of the river Pabbar, the river Pabbar is a major tributary of TONS River. It has both the snow fed and the rain fed catchments. Rumnu Khud originates from Southern Slopes of Chachpur peaks in middle Himalayas at an elevation of 3300 meters above MSL. Rumnu Khud flows towards Southern direction. After flowing for a length of about 10.3 kilometers it joins Pabbar River near village Anti. The highest peak in the catchments area is at elevation of 3300 meters above MSL.

Difficulties faced during construction

Constraints

1. The right bank of the Rumnu Khad consists of overburden material, precluding any choice for possible layouts for Water Conductor System, Power House and Penstock in the area.
2. On the left bank of the Rumnu Khad, there is a road, agriculture land including Apple Orchids.
3. Further in the upper reaches of the Rumnu Khad , the area is very steep and unstable at a few locations.
4. Road exists upto lower reaches of the Rumnu Khad.

Based on the constraints as mentioned above the best possible locations for the Diversion Weir, Desilting Tank, Power Channel, Forebay, Penstock and Power House were selected.

DIVERSION WEIR

The Diversionm weir is constructed at an elevation of 1598 meters above MSL. It is a trench type weir since the scheme is a run of the river scheme and no storage of water is required.

DESILTING TANK:

The water in the Rumnu Khud is comparatively clean, even during monsoon, still a desitling tank of size m X m Xm is constructed. The silt removal in the desilting tank is upto 0.2 mm particle size, a flushing arrangement is also provided in order to enable periodical flushing of the desilting chamber.

POWER CHANNEL:

The Power Channel is constructed on the Left Bank of the Rumnu Khad, the alignment of the Power Channel passes through the Hill Slope forming partly of over burden material and partly through insitu bed rocks. Therefore the Cut and Cover type of Channel is selected for the Power Channel.

PENSTOCK:

The Penstock alignment passes through steep hill slope where in situ bed rocks are very well exposed. Bed rocks forming slopes are highly jointed and at places shattered in nature. Therefore care has been taken for proper anchoring of the penstock.

The penstock crosses the Stream and take a 90 turn before entering the power house. In order to minimise the Head Loss due to right angle bend the Penstock Diameter was increased to 600 mm.

POWER HOUSE:

The Power house site is on the Right Bank of the Rumnu Khad as there is no proper location could be find on the left bank. It necessitated the construction of a bridge on the Rumnu Khad and a 1.2 Km long road.

It has two units of 500 KW each. The turbine is Twin Jet Pelton type of turbine. In order to optimize the output at low discharge period only one jet will come into operation till 30% of discharge and further both the jets will come into operation.

CHALLENGES

The biggest challenge was for transporting the material for the construction of Diversion Weir, Desilting Tank, Power Channel and Forebay.

The problem was over come by installing a 1.4 Km long Rope Way from the road head to Diversion weir. This ropeway was used for transporting the Cement, Steel and other material required for construction. The ropeway helped in cutting down the construction period to a great extent.

The project was commissioned on 9th March 2005, the construction was completed in a period of 18 months.

REFERENCE

http://library.thinkquest.org/17658/hydro/hydhistoryht.html