

THESIS

**STUDY OF HYDROPOWER POTENTIAL AT
KHANPUR DAM**



By

Muhammad Abid
(98-PG-WRE-22)

For the Degree of

MASTER OF PHILOSOPHY

IN

WATER RESOURCES ENGINEERING

CENTRE OF EXCELLENCE IN WATER RESOURCES ENGINEERING
University of Engineering and Technology, Lahore, Pakistan.

February, 2003

ABSTRACT

The recent continuous price hike of electric power has the planners/managers to develop indigenous resources of energy like hydropower. A comprehensive inventory of hydropower schemes having small, medium and large potential sites with low head and high head have been prepared. A large portion of identified potential is economical and environment friendly.

The developed countries have almost developed their major potential of hydropower from large to small size resource being economical to produce electricity. To this a tremendous advancement in small hydro units have come up to meet all the technical and other related aspects. As a number of small hydel potential sites are available, there is need to develop those as they would be economical with less gestation period and can be implemented with ease.

This present study is meant to plan a low head hydel station near Khanpur Dam at the right side of left bank canal (LBC) at RD 4 + 000 at baffle chute, by considering site conditions. Beside technical aspects, the economic, financial and environmental aspects, have also been considered. Throughout this study, detail work has been done to determine the true findings of the planned project.

Hydrological data of left bank canal from Khanpur Dam for the years 1990-1996 has been collected and using 10-daily mean flows power generation and energy have been calculated for estimation of benefits and pattern of available power. For design discharge of $262 \text{ ft}^3/\text{sec}$ ($7.42 \text{ m}^3/\text{s}$) and gross head of 46.4 ft (14.14 m), 0.88 MW power

has been proposed. One unit of vertical shaft Kaplan turbine with low setting has been found out to be the most suitable mechanical equipment to generate electricity.

The proposed location and layout of the project, which is at the right side of left bank canal (LBC) with baffle chute working as spill way is recommended for geological studies. The basic design of head race channel, forebay structure, penstocks, pedestals, power house, turbine and tail race channel have been dimensioned for the design discharge.

The project has been estimated to a total project cost of U.S \$ 764573, which also induced US \$ 388226 as foreign exchange. The study has been checked for its economic viability and the internal rate of return at 12 % discount factor has come out to be 40.96% with benefit cost ratio of 2.14. The results generated showed the sound economic viability with equivalent diesel generation

Finally, the environmental impacts of the proposed hydropower have been discussed. Initial Environmental Examination (IEE) was conducted for its evaluation, which depicted that no major change in terms of, noise, socio-economic, aquatic, wild life, deforestation, dust etc, will be observed and has very minute impacts with mitigating measures.

The results of the present study are very encouraging and are attractive to public and private sectors for project implementation. The study will be useful for agencies interested to invest at this specific site.