

THESIS

**DESIGN OF MEDIUM HYDROPOWER PROJECT AT THE TOE
OF BUNJI DAM PROJECT ON INDUS RIVER**



6919

Submitted by

Inam Ullah Ch.
(2004-PG-HPE-31)

For the Degree of

MASTER OF SCIENCE

IN

HYDROPOWER ENGINEERING

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

2007

ABSTRACT

The continuously escalating energy prices indicates the increasing demand of energy, and necessitates the comprehensive study of micro to medium hydropower potential sites, as development of micro to medium hydropower potential has proved to be economically viable.

Keeping in view the economic situation and energy demand of country, this study was carried out for the development of medium head hydropower potential at the toe of Bunji dam hydropower project site on Indus river.

Bunji dam site is located in District Gilgit and upstream of Indus-Gilgit Rivers confluence at Indus River. Bunji dam Hydropower Power Project is run-off river project so in feasibility study of the project; environmentalists have proposed to release about 40 m³/sec discharge to maintain aquatic life at d/s of Bunji dam. This discharge can be utilized for the power generation. The key objectives of this research are to estimate the power/energy of this project and to design the power conduit, selection of types and number of turbines and sizing of powerhouse. To design the components, required data was collected from Hydroelectric Planning Organization (HEPO) WAPDA, Lahore.

The available gross head at site is 172 m, so by utilizing the available gross head and design flow of 40 m³/sec, the power and energy was estimated which is 62 MW and 15.93 Gwh per month respectively. After assessing the power and energy, design of

penstock, selection of type and number of turbines and sizing of powerhouse was carried out. The design of penstock, penstock's diameter, mean velocity in penstock, velocity of pressure wave, reflection time of pressure wave and closing time of controlling system was determined.

For this research study Francis turbine was selected. The two numbers of turbines were decided by keeping in view cost of units and flow variations. The sizing of selected Francis turbine was carried out by using computer model TURBNPRO. In sizing of powerhouse, the energy of powerhouse was decided to be 47.73 m, spacing between units was kept 14.92 m, repair bay floor and was 451.49 m² width of powerhouse was 18.10 m (with valve) and height of powerhouse crane wall was kept 11 m.