

THESIS

APPLICATION OF HEC-RAS AND DERIVATION OF HYDRAULIC
PARAMETERS FOR THE DESIGN OF MITHANKOT
HYDROPOWER PROJECT ON RIVER INDUS



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ABSTRACT

APPLICATION OF HEC-RAS AND DERIVATION OF HYDRAULIC PARAMETERS FOR THE DESIGN OF MITHANKOT HYDROPOWER PROJECT ON RIVER INDUS

This study has been carried out to estimate the hydraulic parameters by using computer model HEC-RAS, for the optimum sizing of proposed Mithankot hydropower project. The powerhouse of is proposed inside the body of Mithankot Barrage. It is usually called block power plant as all the turbines are accommodated in one block on right side of the River Indus. The proposed hydropower project can be classified as a small low-head non-diversion type hydropower plant.

The installed capacity of hydropower plants is calculated with the help of *hydraulic head and discharge data* at the proposed site. *HEC-RAS* model has been used to compute the water surface elevations at the upstream and downstream of proposed Mithankot barrage. From this data an estimation of hydraulic head during whole year was done.

HEC-RAS has a lot of advantages over its predecessor *HEC-2* one of which is the unsteady flow simulation option. Also the vertical variation of Manning's roughness coefficient value is possible and very easily controlled due to the GUI structure of *HEC-RAS*. The numerical model prepared in this study is found quite stable to the variation in the values of significant input parameters. That means the model is not very sensitive which was not the case with models prepared in the past by using *HEC-2*.

The power and energy outputs from the proposed hydropower project were calculated for various scenarios. Four to ten turbine units were tested for different values of efficiency of electro-mechanical equipment. The installed capacity of proposed Mithankot hydropower project

comes out to be 122 MW; annual energy = 690 GWh and plant factor = 65. Keeping in view all the options, it is suggested that 6 units (20 MW each) will be the best option to generate the maximum available energy at site.

The current version of *HEC-RAS* has some known bugs and deficiencies for which a few recommendations have been given in this study for future improvement of the model.