THESIS

POWER POTENTIAL OF JABBAN HYDROPOWER PLANT UNDER CHANGED FLOW CONDITIONS

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ABSTRACT

In 1937, a hydropower project of 9.6 MW capacity consisting of 3 units of 3.2 MW each was constructed at Jabban on Upper Sawat Canal for which a power tunnel called Barkit tunnel was excavated on right side of the outlet of Benton tunnel. In 1952, two additional units of 5 MW each were installed thus enhancing the total generation capacity of Jabban hydropower project to 19.6 MW. Khyber Pakhtunkhwa government constructed Malakand III hydropower project of 81 MW capacity on Upper Sawat Canal which is fed through auxiliary tunnel (parallel to Benton Tunnel). Water of Upper Sawat canal will be shared between Jabban/Dargai and Malakand-III hydropower projects resulting in reduced power generation of both Jabban and Dargai hydropower plants.

This research study aims to estimate the power and energy of Jabban Hydropower Project with modified flows left with Wapda after diversion to Malakand III (81 MW HPP) and selection of best alternative with modified flows.

Initially a spreadsheet was used to determine the power potential and annual energy output of the hydel station. The spreadsheet calculations were simply based on power formula. Some allowance for forced outages approximately equivalent to 20 days was also kept in view during calculations. Since the main purpose of the study was selection of best alternative with computer application of Turban Pro Software, therefore three alternatives were envisaged consisting of alternative I with three units, alternatives II with four units and alternative III with five units.

The detailed analysis with Turban Pro software for each alternative concluded that alternative I with three units was most suitable for enhancing power potential of Jabban Hydroelectric power station from existing 19.6 MW to 23 MW under modified flow conditions.

The penstock pipe was redesigned and various checks for safety operation of penstock were carried out. The maximum penstock thickness was calculated corresponding to the maximum head. The effective thickness after subtracting corrosion allowance of 2 mm from the maximum penstock thickness is 24 mm. Penstock pipes are prone to various internal and external stresses that may potentially cause severe damages. Hence transient analysis was also carried out but it is recommended to use the transient analysis software like AFT Impulse for detailed analysis.