THESIS

SEDIMENT SIMULATION FOR INTAKE STRUCTURE OF A HYDROPOWER PROJECT
(A Case Study: Doyian Hydropower Project)

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(2001-PG-HPE-22)

For the Degree of

MASTER OF SCIENCE

IN

HYDROPOWER ENGINEERING

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

2004

ABSTRACT

The sedimentation process in Hydropower projects affects the intake area and reduces the life of the reservoir, the study of which is essential for operation of the hydropower projects for daily peaking. The extent of reduction of storage and entrance of sediment to the intake depends on the geometry of the planned reservoirs, the location of the intake and nature of river flows. These should be investigated with the help of historic hydrographs in the model tests with moveable bed.

The Doyian HHP at Astore River for which this study is made is in feasibility stage. For establishing the optimum layout of the project and to study the sediment behaviour in post dam conditions, the physical model study of the project is underway at IRI. This present study was carried out in advance to study the river pattern, sediment deposition in and around the intake area and expected life of the reservoir estimated. Suggestions for plant operation has also been made and checked with flushing options.

HEC-6 one dimensional model of US Army corps of Engineers was used for study, Standard step method with Energy, .Manning and continuity equations is the basic tool of hydrological simulation in the model. Exner equation with 12 transport functions is the basis of sediment transport calculations in HEC-6. Historical data of the Astore River from 1974 to 1999 including discharge, sediments inflow and gradation of suspended and bed material sediments was used in the study. Operating rule curve for the HHP is established and followed for the Discharge Rating input to the model. Acker & White equation was used for sediment transport.

Model was calibrated with the observed water elevation against river flows in physical model at IRI. Model was checked for stability analysis. Mass Balance of Capacity reduction due to sediment deposition was also made. Results indicated that the model is compatible tool for this study. Estimated life of the reservoir with respect to the sediment deposition is 14 years. Trap efficiency of the reservoir having reducing trend, and allowing passing heavier size particle out from the reservoir after longer operation of the reservoir. Flushing of the reservoir is applicable and can be applied physically when required.