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Thesis Title: *Optimal Design of Penstock using Genetic Algorithm Optimization*

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Degree: *M.Sc.*

Major: *Civil Eng.*

Field: *Hydraulic Structure*

University: *Tabriz*

Faculty: *Civil Eng.*

Graduation Date: *Dec 2009*

Page: *154*

Keywords: Penstock, Hydroelectric Plant, Optimization, Meta-heuristic, Genetic Algorithm

#### Abstract:

Hydroelectric power plants are one of the greatest energy suppliers in the world and it has been invested especially in countries which have remarkable hydro resources. Low environment contamination, shelf life and its economical process makes it preeminent to the fossil fuel power plants.

Generally hydraulic power plants consist of dam (which could be concrete or dike type), turbines, valves, spillways, baffles, high pressure water pipes (penstocks) and the electric generation instruments. Optimization of each mentioned parts has a great effect on reducing of costs and increasing of efficiency. Our favorite in this thesis is the optimization of penstock systems which are the costly part in hydraulic power plants.

Penstock is a high pressure pipe which transfers water from any resource or any over head to the turbines. Its design fundamentals are like as a high pressure pipes. We've used the Heuristic Optimization method which is the one of nature-inspired algorithm methods.

The practical data of penstocks for three different cases included a simple system that transfer the water from a source to the channel, the Shasta dam in California and Shariar dam in Miyaneh –Iran have been selected for experimental analysis and case study section of this thesis. The results of used method show the acceptable range of optimization percentage for penstock systems in each case.

The loss effects in penstock pipes, calculation and introducing of surge effect in optimization equations and also optimization of penstock basin structure could be considered for further activities to increasing of results precision. Using penstocks with different materials (non concrete and non steel lines) and using of other optimization methods also could be help to achieving better results for supplemental activities.



Faculty of Civil Engineering  
Dept. of Water Resources Engineering

Thesis

In Partial Fulfillment of the Requirements for the Degree of Master of  
Science in Hydraulic Structures

Title

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Dec 2009