

**OPTIMUM DISPATCH OF TURBINES IN A LOW HEAD
HYDROPOWER PLANT FOR A GIVEN TOTAL FLOW
RATE AND AVAILABLE VARIABLE HEAD - A CASE
STUDY FOR MORAGAHAKANDA POWER STATION
IN SRI LANKA**

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188538T

Degree of Master of Science

Department of Electrical Engineering

University of Moratuwa

Sri Lanka

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DECLARATION

I declare that this is my own work and this thesis does not incorporate without acknowledgement any material previously submitted for a Degree or Diploma in any other University or institute of higher learning and to the best of my knowledge and belief, it does not contain any material previously published or written by another person except where the acknowledgement is made in the text.

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The above candidate has carried out research for the Masters thesis under my supervision.

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Date:

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Dr. Logeeshan Velmanickam

Abstract

Hydropower is an extremely valuable resource. There are two types of reservoir based hydropower stations with different main goals. Some are following the demand of the utility and others follow irrigation water requirements. Therefore, always power generation is not at full capacity, and most of the time turbines are at partial loads as well.

By optimal hydropower generation and scheduling, great profits can be achieved for the company and also for the country. Therefore, the economical dispatch of hydropower generation provides great opportunities for electric utilities.

Moragahakanda hydropower station generates electrical power as an outcome of the irrigation water requirement, decided by the Water Management Secretariat (WMS) which is headed by the Mahaweli Authority of Sri Lanka (MASL). This research presents a strategy for the optimum distribution of dispatched power among its available generating units. The objective is the maximization of the total power generation for a low-head hydropower plant under varying head and for a given total water discharge rate.

Hydropower generation scheduling is a nonlinear programming problem. The nonlinearity is due to the generating characteristic of the hydro turbines, whose outputs are generally a nonlinear function of water discharge and net hydraulic head. This research work presents a method that takes into account both the nonlinear characteristic and the head loss effect.

This development is done based on the Moragahakanda hydropower station and, MATLAB software has been used for building mathematical models and solving the optimization problem.

Keywords: Hydropower generation, Optimal dispatch, Optimization method, Economical dispatch.

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TABLE OF CONTENT

	Page
DECLARATION	i
ABSTRACT.....	ii
ACKNOWLEDGEMENT	iii
TABLE OF CONTENT	iv
LIST OF FIGURES	vii
LIST OF TABLES	viii
LIST OF ABBREVIATIONS	ix
LIST OF APPENDICES	x
INTRODUCTION	1
1.1 Background	1
1.2 Moragahakanda hydropower plant	2
1.3 Problem statement.....	3
1.4 Running characteristic curves	3
1.5 Research goals and objective	4
1.6 Thesis overview	4
LITERATURE REVIEW	5
2.1 Types of hydropower plants.....	5
2.2 Types of turbine	5
2.3 Mathematical relationships for hydropower generation	7
2.4 Hydropower losses	9
2.4.1 Elevation of the reservoir water level	9
2.4.2 Elevation of the downstream tailrace water level	9
2.4.3 Penstock head losses	10

2.4.4 Turbine efficiency	10
2.4.5 Generator efficiency.....	12
2.5 Nonlinear relationship of the hydro performance model	13
2.6 Optimization of the hydropower plants	15
2.7 Optimization methods of hydropower plant	16
2.8 Classical economical dispatch optimization problem.....	16
2.9 Efficiency measurements optimization problem.....	17
2.10 Loss minimization optimization problems.....	18
2.11 Solving techniques for the optimization problem	19
PROBLEM FORMULATION.....	20
3.1 Optimization modelling	20
3.2 Notations	22
3.3 Objective function.....	22
3.4 Bounds and constraints	23
3.5 Obtaining the boundaries and constraints	24
3.5.1 Obtaining the power generation limits.....	24
3.5.2 Obtaining the water discharge flow rate limitations of the generation units	25
3.5.3 Given total water discharge equality constraint.....	27
HYDRO PERFORMANCE MODEL EQUATION FOR POWER GENERATION 28	
4.1 Collecting a set of past operation historical data	28
4.2 Power generation vs. water discharge curves	28
4.3 Surface fittings	32
MATLAB OPTIMIZATION	36
5.1 Possibilities of the dispatching of the units.....	36
5.2 Results and analysis	37

5.3 Application 01.....	37
5.4 Application 02.....	42
5.5 Validation.....	46
CONCLUSION AND RECOMMENDATIONS FOR FURTHER STUDIES	50
REFERENCES	52
Appendix 1: Running characteristic curve for 5MW unit.....	53
Appendix 2: Running characteristic curve for 7.5MW unit.....	54
Appendix 3: Collected data set from the SCADA system.....	55
Appendix 4: MATLAB codes.....	59

LIST OF FIGURES

	Page
Figure 1.1: Moragahakanda reservoir and dam	2
Figure 2.1: Classification of the hydro turbines [1]	6
Figure 2.2: Efficiency /Flow characteristics for different turbine types [1]	7
Figure 2.3: Tailrace elevation variation with water discharge in the Itaipu power plant [4]	10
Figure 2.4: Turbine Hill curve	11
Figure 2.5: Performance curves of a Francis-type turbine [3]	12
Figure 2.6: Typical generator efficiency curve	13
Figure 2.7: Power generation vs flow rate	13
Figure 2.8: Set of characteristic curves with polynomial approximation [9]	14
Figure 3.1: Modeling of the Moragahakanda power station	21
Figure 3.2: Obtaining the power generation limits from the characteristic curve of 7.5MW unit	25
Figure 3.3: Operating limits curve for Unit 5MW	26
Figure 3.4: Operating limits curve for Unit 7.5MW	26
Figure 4.1: G1A-Power generation vs water discharge for different unit head levels	29
Figure 4.2: G1B-Power generation vs water discharge for different unit head levels	30
Figure 4.3: G2-Power generation vs water discharge for different unit head levels	30
Figure 4.4: G3-Power generation vs water discharge for different unit head levels	31
Figure 4.5: MATLAB surface and curve-fitting toolbox	32
Figure 4.6: G1A surface fitting; P1: Power generation in MW, Q1: Water discharge flow rate in m ³ /s, H1: Unit head in m	34
Figure 4.7: G1B surface fitting; P2: Power generation in MW, Q2: Water discharge flow rate in m ³ /s, H2: Unit head in m	34
Figure 4.8: G2 surface fitting; P3: Power generation in MW, Q3: Water discharge flow rate in m ³ /s, H3: Unit head in m	35
Figure 4.9: G3 surface fitting; P4: Power generation in MW, Q4: Water discharge flow rate in m ³ /s, H4: Unit head in m	35

LIST OF TABLES

	Page
Table 4.1: Comparison of the goodness of the 3D surfaces of MATLAB surface fitting	33
Table 5.1: Different possibilities of dispatching the plant with total water discharge amount	37
Table 5.2: Total maximum water discharges for each case of plant dispatching relevant to the application 1	39
Table 5.3: Solutions of six dispatchings according to application 1	40
Table 5.4: Total maximum water discharges for each case of plant dispatching relevant to the application 2	43
Table 5.5: Solutions of six dispatchings according to the application 2	45
Table 5.6: Actual operating data of 21/03/2018 at 08:00hr from the SCADA system	46
Table 5.7: Best solution from the proposed optimization method for application 1	46
Table 5.8: Best solution from the proposed optimization method for application 1 without G1A	47
Table 5.9: Actual operating data on 13/07/2019 at 06:00hr from the SCADA system	47
Table 5.10: Best solution from the proposed optimization method for application 2	47
Table 5.11: Best solution from the proposed optimization method for application 2 without G1A	48
Table 5.12: Calculation of the extra energy from the optimization model	48

LIST OF ABBREVIATIONS

Abbreviation	Description
DE	Differential Evolution
GA	Genetic Algorithms
LHP	Large Hydro Plants
HPP	Hydro Power Plant
MASL	Mahaweli Authority of Sri Lanka
PSO	Particle Swam Optimization
SCADA	Supervisory Control And Data Acquisition
SHP	Small Hydro Plants
WMS	Water Management Secretariat

LIST OF APPENDICES

Appendix	Description	Page
Appendix 1:	Running characteristic curve for 5MW unit	53
Appendix 2:	Running characteristic curve for 7.5MW unit	54
Appendix 3:	Collected data set from the SCADA system	55
Appendix 4:	MATLAB codes	59