

PUMPED-STORAGE SCHEDULING USING PARTICLE SWARM OPTIMIZATION

Thesis is presented in partial fulfillment for the award of the Bachelor of Electrical
Engineering (Hons) UNIVERSITI TEKNOLOGI MARA



**AMIRUL ASRAF BIN RAZALI
FACULTY OF ELECTRICAL ENGINEERING
UNIVERSITI TEKNOLOGI MARA (UiTM)
SHAH ALAM**

ACKNOWLEDGEMENTS

First of all, I would like to thank Allah s.w.t for His approval and blessing that I manage to finish doing my thesis on time without any problems.

Next, I would like to give my most gratitude to my supervisor Assoc. Prof. Bibi Norasiqin for helping me during the duration to finish this project. I truly honored to be under her as supervisor on this project. This is because through his guidance and teaching, I manage to understand more on Pumped-Storage and also in economic dispatch. The experience and knowledge that I gained during preparing this thesis are useful and meaningful for pursuing my career in engineering field.

I would also like to thank Dr. Chan Sei and Pn. Norziana Aminuddin for the evaluation of my technical paper presentation and technical paper for this project.

Lastly I would like to thank to all my fellow colleagues for the help and supports through the completing of this thesis. Your help will be remembered.

ABSTRACT

This thesis presents the solution algorithm based on the particle swarm optimization (PSO) for solving the pumped-storage (P/S) scheduling problem. The basic PSO algorithms is been used to determine the economic dispatch of the hydrothermal generation with pumped-storage unit. This is because particle swarm optimization (PSO) algorithm is developed to give the economical cost for the hydrothermal generation with pumped-storage unit to fulfill the constraint of thermal and hydro unit. The hydrothermal generation with pumped-storage unit is consisting of 40 thermal units and four pumped-storage units. The algorithm is been develop using Matlab software to test on comprising between hydrothermal generation with pumped-storage unit and hydrothermal generation without pumped-storage unit. Results obtained indicate the attractive properties of the hydrothermal generation with pumped-storage are better than hydrothermal generation without pumped-storage.

TABLE OF CONTENT

<u>CONTENTS</u>	<u>PAGES</u>
DECLARATION	i
ACKNOWLEDGEMENT	ii
ABSTRACT	iii
TABLE OF CONTENT	iv
LIST OF FIGURES	vi
LIST OF TABLES	vi
CHAPTER 1: INTRODUCTION	
1.1 Overview	1
1.2 Objectives	3
1.3 Scope of Work	3
1.4 Thesis Organization	4
CHAPTER 2: LITERATURE REVIEW	
2.1 Introduction	5
2.2 Modeling Pumped-Storage Plant	6
2.2.1 Curve Fitting Technique	7
2.3 Economic Dispatch	8
2.3.1 Type of Economic Dispatch	10
2.4 Pumped-Storage Scheduling Constraints	12
2.4.1 Generation Limits Constraint	12
2.4.2 Power Balance Constraint	13
2.4.3 Hydro Generation Constraint	13
2.4.4 Thermal Generation Constraint	13

CHAPTER 3: METODOLOGY	
3.1 Introduction	14
3.2 Particle-Swarm Optimization (PSO) Algorithm	14
3.2.1 Inertia Weight	17
3.2.2 Constriction Factor	18
3.3 PSO Algorithm for Pumped-Storage Scheduling Coordination	19
3.4 MATLAB Application	23
3.4.1 MATLAB Overview	23
3.4.2 Overview of the MATLAB Environment	24
3.4.3 Evaluating Mathematical Expressions	26
3.4.4 Basic Mathematical Operation	27
3.4.5 Application of MATLAB Function	29
CHAPTER 4: RESULT AND DISCUSSION	
4.1 Introduction	35
4.2 PSO Parameter Setting	35
4.3 Test System	36
4.4 Result	39
CHAPTER 5: CONCLUSION AND FUTURE DEVELOPMENT	
5.1 Conclusion	45
5.2 PSO Parameter Setting	46
REFERENCE	47