INFLUENCE OF DIFFERENT PARAMETERS ON THE COST FUNCTION OF LAKVIJAYA POWER STATION

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Thesis submitted in partial fulfillment of the requirements for the degree Master of Science in Electrical Engineering

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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 under my supervision.

Signature of the supervisor: Date: 12/06/2017

ABSTRACT

Every power plant has its own cost function that describes how its cost varies with the power output. This data is used to find the incremental cost of each unit generated – hence the order in which the plant is dispatched in the merit list prepared by System Control Centre (SCC) of Ceylon Electricity Board (CEB). Lakvijaya Power Station (LVPS) is in operation for more than six years now, but its cost function has not been defined yet. Main target of this research is to define the cost function of LVPS and to determine the independent parameters affecting the function.

There are many parameters that affect the efficiency of the power plant. One is the temperature of inlet air which is used to convey pulverized coal to the furnace and to supply air required for combustion. Another key parameter is the cooling water temperature which is used as the coolant of the condenser. Next one is excess oxygen content in flue gas. Furthermore, mill temperature, power output, main steam pressure and main steam temperature were considered.

By using load levels, cost data and quadratic regression, the cost function was derived. Then the most influencing factors were identified using Pearson correlation analysis. As the second step, it was studied how the selected parameters affect the cost function. Multiple regression was used for those calculations. SPSS package was the selected tool for this analysis.

Validation for the final output was done for many cases and that proved realistic behavior of the derived function. This relationship can be used to identify the parameters affecting the efficiency and to which extent it influences the cost function. This function is recommended to be used for decision making and for the efficiency calculation of Lakvijaya Power Station.

Key words: cost function, incremental cost, plant dispatch, quadratic regression, multiple regression, efficiency

DEDICATION

I dedicate this thesis to my beloved parents, who have guided me from the very beginning of my life with endless love. And also to my two sisters who have been with me and helped me in difficult times in my whole life. And my ever loving wife Chiranji, who never lost faith in me even in very tense and difficult times and loved me unconditionally.

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LIST OF ABBREVIATIONS

Abbreviation	Description
CEB	Ceylon Electricity Board
LVPS	Lakvijaya Power Station
SCC	System Control Centre
SPSS	Statistical Package for Social Sciences
MST	Main Steam Temperature
MSP	Main Steam Pressure
CCS	Carbon Capture and Storage
HP	High Pressure
IP	Intermediate Pressure
LP	Low Pressure
FGD	Flue Gas Desulfurization
ESP	Electrostatic Precipitator
SCR	Selective Catalytic Reduction
PASW	Predictive Analytic Software