

**METHODS TO IMPROVE FLY ASH QUALITY IN  
LAKVIJAYA POWER STATION**

H.K.M. Malraj

(139512V)

Degree of Master of Science

Department of Electrical Engineering

University of Moratuwa

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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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## Abstract

Fly ash is a byproduct of coal fired power generation which may cause environmental and social problems. Lakvijaya power station which is the largest power station in Sri Lanka is facing problems with fly ash dumping. Dumping of fly ash inside the power plant premises has created environmental and social issues. These issues have caused to arise objections from the society against developing new coal fired power plants in Sri Lanka.

Fly ash can be sold to the cement manufactures for productive use without dumping at the power station premises. Though cement manufactures need the Loss of Ignition (LoI) value of fly ash to be less than 5% it is often higher in the Lakvijaya power station. It is observed that reducing the load gives better fly ash quality but, it has an impact on economical dispatch of power plants in the system. Therefore, the study focused on the methods to reduce fly ash LoI level by analyzing boiler operating parameters.

Nine boiler related parameters were identified that would have impact on fly ash LoI level. Data were extracted from unit 1 boiler of Lakvijaya power station for one month. Factor analysis and multiple linear regression methods were used to analyze data. Factor analysis is used to identify correlated variables and suitable adjustments were made prior to conduct of multiple regression analysis.

Regression model of the system was used to identify the impact of each parameter on the fly ash LoI level. The results show that total air flow and primary air pressure are not sufficient for the complete combustion at the higher coal rates so that, capacity enhancements for those systems are recommended. Further, boiler operators should be advised to maintain highest possible set points for primary air temperature and secondary air pressure which will contribute to reduce the LoI level in fly ash.

Key words: *fly ash quality, factor analysis, multiple linear regression*

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## TABLE OF CONTENTS

Declaration of the candidate & Supervisor	i
Acknowledgements	ii
Abstract	iii
Table of content	iv
List of Figures	viii
List of Tables	ix
List of abbreviations	x
List of Appendices	xi
1. Introduction	1
1.1 Lakvijaya power station	1
1.2 Importance of the power station	1
1.3. Boiler unit of the power station	2
1.4. Ash handling system	3
1.5. Research problem	4
1.5. Coal fly ash	4
1.5.2. Wet unload method of fly ash	5
1.5.2.1. Wet unload method	5
1.5.2.2. Environmental and social issues of wet unload	5
1.5.3. Dry unload method of fly ash	6
1.5.3.1. Dry unload method	6

1.5.3.2. Financial benefits of dry unload	6
1.5.4. Quality of fly ash	9
1.5.4.1. Loss of ignition	9
1.5.4.2. Impact of fly ash quality on plant operation	9
2. Literature review	11
2.1. Background of the study	11
2.2. Factors affecting fly ash LoI	11
2.2.1. Factors related to coal	11
2.2.2. Factors related to boiler	12
2.3. Multiple linear regression	13
2.4. Factor analysis	15
2.5. Artificial neural network	15
3. Methodology	17
3.1. Factor model of the system	17
3.1.1. Data collection for factor analysis	17
3.1.2. Tests before conducting factor analysis	18
3.1.3. Results of factor analysis	18
3.1.3.1. Total variance explained	18
3.1.3.2. Factor loading	19
3.1.4. Analysis of results of factor analysis	19
3.2. Regression model of the system	21
3.2.1. Tests before conducting linear regression	21
3.2.1.1. LoI Vs. air to coal ratio plot	22

3.2.1.2.	LoI Vs. furnace pressure plot	23
3.2.1.3.	LoI Vs. primary air pressure	24
3.2.1.4.	LoI Vs. primary air temperature plot	25
3.2.1.5.	LoI Vs. burner angle plot	26
3.2.1.6.	LoI Vs. secondary air pressure plot	27
3.2.1.7.	LoI Vs. secondary air temperature plot	28
3.2.2.	Analysis of linearity test	29
3.2.3.	Test the violation of assumptions	30
4.	Results and Discussion	31
4.1.	Results of regression analysis	31
4.1.1.	Normality test	31
4.1.2.	Test the heteroscedasticity	32
4.1.3.	Test the auto-correlation	33
4.1.4.	Test the multicollinearity	33
4.1.5.	F test	34
4.2.	Analysis of results	35
4.2.1.	Air to coal ratio	35
4.2.2.	Furnace Pressure	36
4.2.3.	Primary air pressure	36
4.2.4.	Primary air temperature	38
4.2.5.	Burner angle	40
4.2.6.	Secondary Air Pressure	40
4.2.7.	Secondary Air Temperature	41



5. Conclusions and Recommendations	43
Reference List	44
Appendix A: Coal quality parameters	45
Appendix B: Sample of data set obtained	46
Appendix C : Heteroscedasticity Test	47

## LIST OF FIGURES

	Page	
Figure 1.1	Boiler layout of a subcritical coal power plant	3
Figure 1.2	Flue gas, ESP in operation Vs out of operation	7
Figure 1.3	ESP units of the power plant	7
Figure 1.5	Dry unloading of fly ash for cement production	8
Figure 1.4	Dumped ash inside the power plant by wet unloading	8
Figure 3.1	Variation of variables for 30 days	17
Figure 3.2	Scatter plot of LoI Vs. Air to Coal ratio	22
Figure 3.3	Scatter plot of LoI Vs. Furnace Pressure	23
Figure 3.4	Scatter plot of LoI Vs. Primary air pressure	24
Figure 3.5	Scatter plot of LoI Vs. Primary air temperature	25
Figure 3.6	Scatter plot of LoI Vs. Burner angle	26
Figure 3.7	Scatter plot of LoI Vs. Secondary air pressure	27
Figure 3.8	Scatter plot of LoI Vs. Secondary air temperature	28
Figure 4.1	P-P plot of the residuals	32

## LIST OF TABLES

	Page	
Table 1.1	Thermal parameters of the boiler	2
Table 1.2	Composition of coal fly ash	4
Table 3.1	KMO and Bartlett's test results	18
Table 3.2	Total variance explained	19
Table 3.3	Rotated component matrix	20
Table 3.4	Collinearity coefficient for each variable	20
Table 3.5	R <sup>2</sup> values and Equation for each plot of LoI Vs. ACR	22
Table 3.6	R <sup>2</sup> values and Equation for each plot of LoI Vs. FP	23
Table 3.7	R <sup>2</sup> values and Equation for each plot of LoI Vs. PAP	24
Table 3.8	R <sup>2</sup> values and Equation for each plot of LoI Vs. PAT	25
Table 3.9	R <sup>2</sup> values and Equation for each plot of LoI Vs. BA	26
Table 3.10	R <sup>2</sup> values and Equation for each plot of LoI Vs. SAP	27
Table 3.11	R <sup>2</sup> values and Equation for each plot of LoI Vs. SAT	28
Table 3.12	Sample of modified data	30
Table 4.1	Model summary of the regression analysis	31
Table 4.2	Coefficients and collinearity statistics of the variables	33
Table 4.3	F test	34
Table 4.4	Variation of fly ash LoI for different air to coal ratio values	36
Table 4.5	variation of fly ash LoI value for different PA pressure values	38
Table 4.6	Variation of fly ash LoI for different PA temperature values	39
Table 4.7	Variation of LoI for different secondary air pressure values	41

## LIST OF ABBREVIATIONS

Abbreviation	Description
ANN	Artificial Neural Network
APH	Air Pre Heater
BMCR	Boiler Maximum Continuous Rating
BPG	Breusch-Pagan-Godfrey
CEB	Ceylon Electricity Board
CMEC	China National Machinery & Equipment Import & Export Corporation
ESP	Electro Static Precipitator
KMO	Kaiser–Meyer–Olkin
LoI	Loss of Ignition
MLR	Multiple Linear Regression
PAP	Primary Air Pressure
PAT	Secondary Air Temperature
PCPP	Puttalam Coal Power Project
SAP	Secondary Air Pressure
SAT	Secondary Air Temperature
SPSS	Statistical Package for Social Sciences

## **LIST OF APPENDICES**

Appendix	Description	Page
Appendix - A	Coal quality parameters	45
Appendix – B	Sample of data set obtained	46
Appendix – C	Heteroscedasticity Test	47