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TECHNOLOGY IMPROVEMENT OF HOT AIR GENERATING SYSTEMS IN TEA INDUSTRY

By

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This thesis was submitted to the Department of Mechanical Engineering of the University of Moratuwa in partial fulfillment of the requirement for the Degree of Master of Engineering in Energy Technology.

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DECLARATION

I hereby declare that this submission is my own work and that, to the best of my knowledge and behalf, it contains no material previously published or written by another person nor material, which to substantial extent, has been accepted for the award of any other academic qualification of a university or other institute of higher learning except where acknowledgment is made in the text.



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ABSTRACT

The present available thermal energy consuming patterns in tea industry were studied by selecting ten number of tea factories, covering three zonal areas in the country in order to carry out technology improvement of hot air generating systems for tea drying.

A continuous fuelwood charging system, which was designed and fabricated by National Engineering Research & Development Centre (NERDC), was introduced instead of manual fuelwood charging system at an up country tea factory. This system consists of a conveyer to charge fuelwood to the hopper, a small hopper to store fuelwood at a certain period for combustion, a screw feeder to feed fuelwood to the combustion chamber and a control circuit to control the fuelwood charging rate by sensing the dryer inlet temperature. The successful results revealed that the potential fuelwood saving percentage is around 40 %.

A 450 kW_t -capacity, down draft, fuelwood gasifire was designed and fabricated by the NERDC and this was introduced to supply hot air to the length of 4 feet & the capacity of 150 kg Endless Chain Pockets (ECP) dryer at the Tea Research Institute (TRI), Rathnpura. The endurance test was carried out continuously for a period of three months and analyzed data showed an average fuelwood saving of the gasifire system is around 50 % compared to the existing system.

The total fuelwood saving in tea industry was estimated by considering three different systems with respect to the present technology used. The foreign exchange saving was assessed by considering all fuel oil air heaters in the country. Also the economic analysis of each system was carried out in order to findout financial benefits.

Except of those technical economical factors, few values added - non quantified environmental benefits such as reduction of deforestation, CO & CO₂ emissions, were associated with this study. Finally merits and demerits among each of the traditional and improved systems were considered.

CONTENTS

Item	Page No
DECLARATION	i
ABSTRACT	ii
CONTENTS	iii
LIST OF TABLES	vii
LIST OF FIGURES	viii
ACKNOWLEDGEMENT	x
CHAPTER 1 : RESEARCH PROBLEM BEING ANALYZED	1
1.1 Energy Consumption Patterns in Tea Industry	1
1.1.1 Electrical Energy Consumption	2
1.1.2 Thermal Energy Consumption	2
1.1.3 Fuelwood Consumption Patterns in Tea Industry	3
1.2 Research Problem at the Scene	4
1.3 Objectives of the Study	6
1.4 Rationale and Justification	7
CHAPTER 2 : LITERATURE SURVEY ON FUELWOOD COMBUSTION TECHNOLOGIES AND AVAILABLE AIR HEATERS IN TEA INDUSTRY	9
2.1 Fuelwood Conversion Technologies	9
2.2 Fuelwood Combustion	12
2.2.1 Combustion Reactions	12
2.2.2 Combustion Controlling Factors	12

2.3 Characteristics of Fuelwood	16
2.3.1 Elemental Analysis of Fuelwood	16
2.3.2 Calorific Values of Local Fuelwood	17
2.4 Fuelwood Handling Technologies	17
2.4.1 Fuelwood Storage	17
2.4.2 Fuelwood Charging Systems	18
2.5 Fuelwood Gasification	20
2.5.1 Gasification Process	21
2.5.2 Reactor Zones	22
2.6 Gasifier Efficiency	23
2.7 Different Types of Gasifire	24
2.7.1 Updraft (Counter current) Gasifire	24
2.7.2 Down Draft Gasifire	26
2.7.3 Cross Draft Gasifire	28
2.7.4 Fluidized Bed Gasifire	29
2.8 Tea Dryers	30
2.8.1 Conventional Dryers	30
2.8.2 Fluidized Bed Dryers (FBD)	31
2.8.3 Performance Comparisons of Tea Dryers	33
2.8.4 Available Energy Consumption Values in Tea Factories in Sri Lanka	34

CHAPTER 3: HOT AIR GENERATOR PERFORMANCE IN SELECTED TEA FACTORIES	35
3.1 Fuel wood Air Heaters	35
3.1.1 Self Containing Hot Air Generators (Traditional System)	36
3.1.2 Hot Air Generate Through Boiler System	37
3.2 Fuelwood Combusting Traditional Type Hot Air Generators	39
3.3 Diesel Fired Self Containing Hot Air Generators	42
3.4 Fuelwood Combusting Hot Air Generator through Boiler System	43
3.5 Comparisons of Analyzed Data	46
 CHAPTER 4: TECHNOLOGY IMPROVEMENT AND FEASIBILITY ANALYSIS	 47
4.1 Continues Fuelwood Charging System	47
4.1.1 Experimental Set Up of the Pilot Plant	47
4.1.2 Variation of Hot Air Temperature	51
4.1.3 Variation of Flue Gas Temperature	52
4.1.4 Fuelwood Consumption	53
4.1.5 Energy Calculations and Comparisons	55
4.2 Gasifire Introduced to the Tea Dryer	57
4.2.1 Gasifire Selection	57
4.2.2 Components of the Gasifire	58
4.2.3 Gasifire Connected to Tea Dryer	60
4.2.4 Endurance Test and Performance Evaluation	62
4.2.5 Temperature Comparisons of Traditional and Gasifire Systems	63

4.2.6	Energy Calculations and Comparisons	64
4.2.7	Summary of Hot Air Generators in the Country	66
CHAPTER 5: ECONOMICAL AND TECHNICAL ANALYSIS		67
5.1	Comparisons of Fuelwood Consumptions in Different Systems	67
5.2	Economical Considerations in Different Systems	69
5.3	Annual Fuelwood Saving	75
5.4	Foreign Exchange Saving	76
5.5	Technical Implementation	76
5.5.1	Fuel Preparation	77
5.5.2	Tar Production	77
5.5.3	Explosions	77
5.5.4	Fuel Blockage	78
5.5.5	Corrosion	78
CHAPTER 6: DISCUSSION AND CONCLUSION		79
REFERENCES		84
APPENDIX 01 NOMENCLATURE		86
APPENDIX 02 USEFUL EQUATIONS		87
APPENDIX 03 USED DATA		89

LIST OF TABLES

	Page No
CHAPTER 1	
1.1 Thermal and Electrical Energy Shared in the Tea Industry	2
1.2 Number of Operational Tea Factories and the Dryers in the Country	4
CHAPTER 2	
2.1 Calorific Values of Fuelwood	17
2.2 Fuelwood Storage Requirement for Different Size Boilers	18
2.3 Performance of Different Types of Tea Dryers	34
2.4 Available Energy Consumption Values for Tea Drying	34
CHAPTER 3	
3.1 Summarized Performance Test Results of Fuelwood Combusting Self Contained Hot Air Generators (Traditional System)	40
3.2 Summarized Performance Test Results of Diesel Fired Self Contained Hot Air Generators	42
3.1.1 Summarized Performance Test Results of Fuelwood Combusting Hot Air Generated in Boiler Plants	44
CHAPTER 4	
4.1 The Charging Sequence and Consumption of Fuelwood	54
4.2 Comparisons Before and After Modifications	55
4.3 Energy Calculations and Comparisons	64
4.4 Comparisons of Performance in Different Types of Air Heaters	66
CHAPTER 5	
5.1 Annual Fuelwood Consumption and Saving	68
5.2 Economical Considerations in Different Systems	72
5.3 Estimated Foreign Exchange Saving	76

LIST OF FIGURES

	Page No
CHAPTER 1	
1.1 Fuelwood Consumption Pattern in Agro Sector	3
1.2 Flue Gas Temperature Variations of Fuelwood Furnace in Different Tea Factories	5
1.3 Excess Air Percentage Variations of Fuelwood Furnace in Different Tea Factories	6
CHAPTER 2	
2.1 Direct Combustion and Thermo chemical Conversion Options Using Fuelwood	11
2.2 Fuel Silo	19
2.3 Fuel Bunker	20
2.4 Up draft Gasifire	26
2.5 Down Draft Gasifire	28
2.6 Cross Draft Gasifire	29
2.7 Fluidized Bed Dryer	33
CHAPTER 3	
3.1 Typical Layout of Traditional Type Hot Air System	36
3.2 Typical Layout of Boiler Type Hot Air System	38
CHAPTER 4	
4.1 Screw and the Spreader of the Feeder	48

4.2	Screw Feeder Retrofitted to the Existing Furnace	49
4.3	Control Panel of Feed Controlling System	50
4.4	Screw Feeder Connected to Tea Dryer	50
4.5	Air Heater Outlet (Dryer Inlet) Temperature Variations	51
4.6	Flue Gas Temperature Variations	53
4.7	Gasifire Components	58
4.8	Layout of Gasifire Connected to Tea dryer	61
4.9	Endurance Test and Performance Data	62
4.10	Temperature Variations of Traditional and Gasifire Systems	63

CHAPTER 5

5.1	Annual Fuelwood Saving in Different Implementation Stages in Different Systems	75
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