APPLICABILITY OF KALINA CYCLE FOR WASTE HEAT RECOVERY IN THEMAL POWER STATIONS IN SRI LANKA

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(128358K)

Degree of Master of Engineering in Energy Technology

Department of Mechanical Engineering

University of Moratuwa
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February 2017

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DECLARATION

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ABSTRACT

Energy Crisis is the critical problem faced by the modern world. Day by day the impact is becoming severe with decaying of fossil fuels. Therefore, whole world has paid their attention on Non Conventional Renewable Energy sources. Industrial Waste Heat Recovery is one of them. The main focus of this thesis is to identify the best suited method for recovering low-grade energy from thermal power stations in Sri Lanka. Among few methods, Kalina Cycle System is selected by concerning its viability for usage.

Several attempts were made to assess the available heat energy from thermal power stations in Sri Lanka. The first objective of this research is to assess the thermal energy wasted from thermal power stations operating in Sri Lanka. The next objective was to identify the best suited configuration of Kalina Cycle System for extracting low-grade heat energy. The final objective was to use the said system for harnessing the energy, and quantify them. Simultaneously an economic analysis was carried out to assess its economic feasibility. A literature review was done to identify possibilities of harnessing the energy from flue gas of thermal power stations and to find out the suitable method for extracting energy.

Lakvijaya Power Station and Kelanitissa Combined Cycle Power Station, which have emissions below 200ºC, has the ability of generating electricity using the Kalina Cycle. However, as per the analysis, they are not economically feasible. However, with these results, it is suggested to continue the same exercise to other thermal power stations, which has high temperature flue gases. As the next step, it is proposed to identify the best suited Kalina Cycle System for the rest of thermal power stations and expand this exercise throughout CEB owned and private owned thermal power stations, using other suitable configurations of Kalina Cycle System.

Key words: Waste Heat Recovery, Kalina Cycle System, thermal efficiency, flue gas

ACKNOWLEDGEMENT

I am very much grateful to Prof. K.K.C.K. Perera, Senior Lecturer, Department of Mechanical Engineering, University of Moratuwa for giving me his valuable guidance on this research. Sincere gratitude is granted to Dr. R.A.C.P. Ranasinghe - Senior Lecturer for giving his fullest support in every stage of this research. I wish to thank Dr. H.K.G. Punchihewa - Senior Lecturer, Dr.(Mrs.) M.A. Wijewardhana - Senior Lecturer and Mr. S.D.L. Sandanayake - Lab Attendant from Department of Mechanical Engineering, University of Moratuwa and Mr. Rumesh Fernando, Mechanical Engineer, Ceylon Electricity Board. This research was carried out under the supervision of Prof. K.K.C.K. Perera, Senior Lecturer, Department of Mechanical Engineering, University of Moratuwa and Dr. R.A.C.P. Ranasinghe, Senior Lecturer, Department of Mechanical Engineering, University of Moratuwa. I would like to thank my loving wife Ruvini Aberathna to encourage and support me in every step of this endeavor. Finally, I would appreciate everyone, who helped me in numerous ways at various stages of the research, which were of utmost importance in bringing out this effort to a success.

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Abbreviation	Description
CEB	Ceylon Electricity Board
GDP	Gross Domestic Product
IC	Internal Combustion
IPP	Independent Power Producers
KCCPP	Kelanitissa Combined Cycle Power Plant
KCS	Kalina Cycle System
NCRE	Non-Conventional Renewable Energy
NPV	Net Present Value
ORC	Organic Rankine Cycle
TFC	Trilateral Flash Cycle