POTENTIALITY OF INTRODUCING ABSORPTION CHILLER SYSTEMS TO IMPROVE THE DIESEL POWER PLANT PERFORMANCE IN SRI LANKA

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

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DECLARATION OF THE CANDIDATE & SUPERVISOR

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ABSTRACT

This aims to find the potentiality of introducing absorption chiller systems to improve the diesel power plant performance in Sri Lanka. The energy efficient operation of diesel power plants is very much important for the country due to the high cost of generation of thermal electricity. Therefore waste heat of diesel power plant is utilized to run a suitable absorption chiller. The considered waste heat is mainly of exhaust and cooling water in the diesel engines of the power plant.

The performance of the power generating diesel engines is considered in two ways. That is in terms of specific fuel oil consumption (SFC) and engine deration. The SFC of the engines varies due to many factors. Since the site conditions in Sri Lanka are not in standard conditions the higher SFC and engine deration is possible. The ISO standard site conditions mean the 25^{o}C (77^{o}F) ambient temperature, 30% relative humidity and a model was developed to evaluate the performance of particular engines. All the temperature values in the model are given in Fahrenheit degrees (^{o}F). It is observed that the engine SFC is low and the engine will not derate at the standard site conditions. From the model it is obvious that when the ambient temperature is 70^{o}F (21.1^{o}C) the engine will not derate due to the effect of humidity even though the percentage of relative humidity reaches 100. In contrast, above 133.6^{o}F (56.4^{o}C) ambient temperature the power plant diesel engines derate due to the effect of humidity irrespective of the value of percentage relative humidity.

The investigated model was applied to evaluate the improved performance of a diesel power plant by introducing an absorption chiller system. The building cooling load was additionally integrated to that system. Therefore it further uplifts the advantages by saving electricity of vapour compression air conditioners.

DEDICATION

I lovingly dedicate this thesis to my family, who supported me in each & every way to make this effort a success.

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LIST OF ABBREVIATIONS

Abbreviation	Description
AC	Air Conditioning
AN	Acid Number
BSFC	Break Specific Fuel Consumption
CEB	Ceylon Electricity Board
CFC	Chloro Fluoro Carbon
COP	Coefficient of Performance
DEMA	Diesel Engine Manufactures Association
HCFC	Hydro Chloro Fluoro Carbon
HP	Horse Power
HT	High Temperature
HTG	High Temperature Generator
LT	Low Temperature
PPP	Privet Power Producer
RH	Relative Humidity
RPM	Rounds Per Minute
SCV	Steam Control Valve
SFC	Specific Fuel Oil Consumption
TBN	Total Base Number
TOC	Total Operating Cost
TR	Tons of Refrigerant
UJPS	Uthuru Janani Power Station

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