Sudan University of Science and Technology

College of Engineering

School of Mechanical Engineering

Power Department

Thermo Economic Optimization of Heat Recovery Steam generator of Combined Cycle Gas Turbine Power Plant

(Case study Garri 1)

A research submitted in partial fulfillment for the requirements of the degree of B.Sc. (Honors) in mechanical engineering (Power department)

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الاستهلال

بسم الله الرحمن الرحيم

قَالَ تَعَالَىٰ:

﴿ قَالُوا۟ سُبْحَٰنَكَ لَا عِلْمَ لَنَآ إِلَّا مَا عَلَّمْتَنَآ ۖ إِنَّكَ أَنتَ ٱلْعَلِيمُ ٱلْحَكِيمُ ﴿٣٢﴾ ﴾

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Dedication:-

To our mothers and fathers, beloved family for always supporting, helping, and standing by us

To our brothers and sisters who stand with us, allow us to use their purpose when we need it to complete this research

To our dear friends who supported us throughout the process

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Abstract :

The objective of this research study effect of heat recovery steam generator of efficiency at Garri power station and just fuel cost, heat recovery steam generating considered effective addition for thermal generation by reduce emissions and benefit by increase out put power .

This research is represented to found appropriate conditions for performance of station so to get highest efficiency and low cost for price of MW.

In this study use MATLAB program during to change working conditions station and to get efficiency 46.12% and price of MW 69 SDG per MW.

In this study we recommend for benefit exhaust gases by stock.

التجريد :-

الهدف من هذا البحث دراسة تاثير مولدات البخار على كفاءة محطة قري 1 ، والتكلفة للوقود فقط ، تعتبر مولدات البخار اضافة فعالة للتوليد الحراري لتقليل الانبعاثات والاستفادة منها في زيادة قدرة المحطة .

تتمثل دراستنا في ايجاد الظروف الملائمة لاداء المحطة بافضل كفاءة واقل تكلفة بسعر الميقا واط .

لتطبيق هذه الدراسة استخدمنا برنامج الماتلاب من خلال تغيير ظروف العمل ، تحصلنا على كفاءة 46.12% للدورة المشتركة و سعر الميقا واط 69 جنيه .

ونوصي بدراسة للاستفادة من الغازات الخارجة بدرجة حرارة عالية من مولدات البخار .

Table of contents

Chapter One : Introduction

Chapter two: Theoretical background and literature Review

Chapter Three: Methodology

Chapter Four: Results and Discussion

Chapter Five : Conclusion and Recommendations

List of Figures

List of Tables

Flow charts

Nomenclature

Symbol/s

Cp	Specific heat at constant pressure	kJ/kg.K
M	Mass flow rate	kg/s
h	Specific enthalpy	kJ/kg
$\mathbf{r_p}$	compressor ratio	-
η	Thermal efficiency	-
a	Air (state)	-
Q	Heat	
q	Specific heat	
Qin	Input heat	
r	Cycle pressure ratio	
rc	Pressure ratio at the compressor	
rt	Pressure ratio at the turbine	
TSg4, hsg4	Property of steam based on gases properties	

List of abbreviations

HCGO	heavy coker gas oil
HRSG	Heat recovery steam generator
HRSGI	State points at Heat Recovery steam generator Inlet
HRSGO	State points at Heat Recovery steam generator outlet
HRVG	Heat recovery vapour generator
IEA	International energy agency in Input