



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 تَعَالَى:

﴿ قَالُوا سُبْحَانَكَ لَا عِلْمَ لَنَا إِلَّا مَا عَلَّمْتَنَا إِنَّكَ أَنْتَ الْعَلِيمُ

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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 تأثير 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 الميكا واط .
لتطبيق هذه الدراسة استخدمنا برنامج الماتلاب من خلال تغيير ظروف العمل ، تحصلنا على كفاءة 46.12% للدورة المشتركة و سعر الميكا واط 69 جنييه .
ونوصي بدراسة للاستفادة من الغازات الخارجة بدرجة حرارة عالية من مولدات البخار .

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Nomenclature

Symbol/s

| | | |
|--------------|---|------------------|
| C_p | Specific heat at constant pressure | kJ/kg.K |
| M | Mass flow rate | kg/s |
| h | Specific enthalpy | kJ/kg |
| r_p | compressor ratio | - |
| η | Thermal efficiency | - |
| a | Air (state) | - |
| Q | Heat | |
| q | Specific heat | |
| Q_{in} | Input heat | |
| r | Cycle pressure ratio | |
| r_c | Pressure ratio at the compressor | |
| r_t | 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 |