بسم الله الرحمن الرحيم

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تم رفع هذه الرسالة بواسطة / سامية زكى يوسف

بقسم التوثيق الإلكتروني بمركز الشبكات وتكنولوجيا المعلومات دون أدنى مسئولية عن محتوى هذه الرسالة.

ملاحظات: لا يوجد

PERFORMANCE STUDY OF FORWARD FEED MULTI-EFFECT DESALINATION PLANT DRIVEN BY SOLAR ENERGY DURING STEADY AND UNSTEADY CONDITIONS

By

Somar Moaen Habib

A Thesis Submitted to the
Faculty of Engineering at Cairo University
in Partial Fulfillment of the
Requirements for the Degree of
DOCTOR OF PHILOSOPHY
in
Mechanical Power Engineering

FACULTY OF ENGINEERING, CAIRO UNIVERSITY
GIZA, EGYPT
2022

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Title of Thesis:

Performance study of forward feed multi – effect desalination plant driven by solar energy during steady and unsteady conditions.

Key Words:
Desalination, Solar Energy, Unsteady State, Dynamic Modeling, (MED-TVC)

Summary:

In this study, a comprehensive analysis had been achieved of forward feed multi effect desalination plant driven by solar energy during steady and unsteady conditions. The obtained steady state results were used as initial values in the developed dynamic model to study the dynamic response in five scenarios of sudden disturbances according to rectangular pulse forcing function؛

- First Scenario; Effect of a variation in the seawater mass flow rate.
- Second Scenario; Effect of a variation in the seawater temperature.
- Third Scenario; Effect of a variation in a flow rate of steam generator heating oil.
- Forth Scenario; Effect of a variation in a flow rate of parabolic trough HTF.
- Fifth Scenario; Effect of a variation in the intensity of the solar radiation.

The dynamic behavior of the plant under these five scenarios and the effect of vacuum escape from receiver tube were investigated and studied in detail, and a clear view of the dynamic response was given which enables to optimize the control strategy and improve the stability of plant's work. Finally, an economic study was achieved for the proposed plant.

Disclaimer

I hereby declare that this thesis is my own original work and that no part of it has been submitted for a degree qualification at any other university or institute.

I further declare that I have appropriately acknowledged all sources used and have cited them in the references section.

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Signature:

Dedication

I dedicate my dissertation to my parents, brothers, and fiancee. A special dedicate to Engineer Malaak Nablion for all his support.

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I would like to express my sincere gratitude to my supervisors: Professor Abdalla S. Hanafi, Professor Mahmoud A. Kassem, Dr. Ahmed Y. Youssef, and Dr. Ahmed H. Hamed for their guidance and continuous help in my work. I would like to thank them for their valuable advice in the different contexts of this thesis. I am also thankful to all Professors of the department for their continuous help and sharing their experience in the relevant work. Moreover, I wish to thank my colleagues at the mechanical power engineering department for their friendship, support and creating an enjoyable working atmosphere throughout my working period.

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