بسم الله الرحمن الرحيم

MONA MAGHRABY

شبكة المعلومات الجامعية

التوثيق الالكتروني والميكروفيلم

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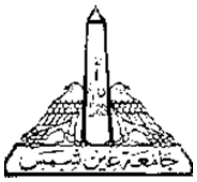

AIN SHAMS UNIVERSITY

FACULTY OF ENGINEERING

A Design for Increasing Power Using a Solar Tower Unit

A THESIS SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENTS OF THE MASTER DEGREE IN MECHANICAL POWER ENGINEERING

B y

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EXAMINERS' COMMITTEE

Theundersignedcertifythattheyhavereadandrecommendedtothe FacultyofEngineering,AinShamsUniversity,foracceptanceofthisthesisentitled:
"A Design for Increasing Power Using a Solar Tower Unit", submitted by Eng. Mohamed Awry Mahmoud Abd El Hafez, in partial fulfillment of the requirements of the degree of Masters of Science in Mechanical Engineering

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Statement

This thesis is submitted as a partial fulfillment of Master degree of Mechanical Power Engineering, Faculty of Engineering - Ain-shams University.

The author carried out the work included in this thesis, and no part of it has been submitted for a degree or a qualification at any other scientific entity.

Mohamed Awry Mahmoud Abd El Hafez

Date: 2019

To:

My

Mother

My

Father

My

Brothers

My wife

My Sons

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Abstract

With the growing demand on electrical power for day to day activities that coincides with less power resources specially for fossil fuels that is also creating many issues for the environment, a big need for shifting round to the Renewable energy resources(e.g. solar , wind , water , sea waves ,…,etc.,)which is more cheaper and effectively clean.
One of the most common renewable energy types is the solar energy with different power generation ways (photovoltaic solar system, thermal solar system).
Many studies were there for enhancing the use of thermal solar system technology that converts radiation from sun into heat energy that would be useful for energy generation through many ways and techniques. One of the newly developed technologies for the thermal solar energy is the solar chimney which is the subject of our study in this research.
Conventional solar chimney theory based on retaining long waves Sun radiation and admits short waves solar radiation through a transparent surface (collector) thus solar radiation is absorbed heating up air that will start raising up inside the chimney where located turbine(s) with electrical generator would start producing electrical power.
In this work, power generation enhancement for a 2.00 m height hexagonal base solar chimney with a 6 double faced trapezium sides is introduced. Amount of energy acquired to move the generating part of the solar tower (direct current fan on the exit) depends on the air flow which will increase with the temperature raise that is affected by the solar heat up of the double faced sides. Analysis and comparison will be based on taking different temperature readings in 3 cases for the stagnant fluid filling the gap of the double faced solar tower sides (air, vacuum and helium) to see the best case where the highest air temperature is reached and consequently having the highest generated power.
In addition to that, a Savonius air turbine is to be fitted on the top of the tower to get more power from the unit in dark time using the wind energy which is a continuous source not relying on solar energy.
Vacuum was found to be the best option due to its lowest heat losses to the surrounding as it acts as heat transfer isolator for conduction, also Savonius was a good addition to the system but with the constrain of having it attached to the system due to induced vibrations and stresses on the solar chimney tower.
Key words: *Solar Chimney, Thermocouple, Savonius wind turbine, Ambient temperature, Air flow, Stagnant air, Stagnant helium,Vacuum, Double wallwindow, wind speed.*

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