DESIGN OF FORCED CONVECTION HEAT TRANSFER RIG

BY

UDOETTE PAUL AKPAN **ME/2008/105**

PROJECT SUMMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF BACHELOR OF ENGINEERING (B. ENG.) DEGREE IN MECHANICAL ENGINEERING.

DEPARTMENT OF MECHANICAL ENGINEERING

FACULTY OF ENGINEERING

CARITAS UNIVERSITY AMORJI-NIKE ENUGU

AUGUST 2013

CERTIFICATION PAGE

This is to certify that this project was executed by Udoette Paul Akpan with the Reg. No; ME/2008/105

---------- ----------

Engr. (Mrs) Mary Onyia **Date**
Project supervisor

---------- ----------

Engr. Ben Iyida **Date**
Head of Department (HOD)

---------- ----------

Prof. A. O. Odukwe
External Examiner **Date**

DEDICATION

This project is dedicated to Almighty God for the strength and will he gave to me right from the beginning of this project to the finish. To my lovely parents (Mr and Mrs Paul Jumbo Akpan) for their all round support throughout my educational carrier.

ACKNOWLEDGEMENT

The merit of this work is beyond my own contribution. Primary among those who contributed to whatever success this work can boast of is my project supervisor, for her dynamism, supervision and constructive criticism. Also lecturers in Mechanical Engineering Department like Engr. S.O Ezenwelu, Engr. Modetus, Engr. Dr. Nwankwoejike , Engr. Dr. A. Ujam for the foundation they gave me to be able to chart this course to this extent.

I deeply acknowledge the efforts of Engr. Ben U. Iyida who since he became the Head of Department has made positive impart in the upliftment of the department.

I specially acknowledge my Dean Professor S. N. Ojobor who has been like a father and a mentor not only to me but all the students of Mechanical Engineering Department thanks for what you have thought me so far and I am proud of you.

Finally, I acknowledge my lovely parent Mr. and Mrs. Paul Jumbo Akpan, my brothers and sisters for their encouragement and support in all aspects of my life, may God bless you all.

ABSTRACT

This project report contains experimental illustration of forced convective heat transfer rig, which consist of a tube, through which air is sent in by a blower. The test section consists of a long electrical surface heater on the tube which serves as a constant heat flux source on the flowing medium. The inlet and outlet temperature of the flowing medium are measured by thermocouple and also the temperature at several locations along the surface heater from which an average temperature can be obtained. An orifice meter is used to measure the airflow rate with a 'U' tube water manometer. An ammeter and voltmeter are provided to measure the power input to the heater. A power regulator is provided to vary the power input to heater. A valve is provided to regulate the flow rate of air. The air being generated by the blower is being passed through a hose connected to a mild steel pipe. The total heat input rate to the air is calculated using q_t = $MC_P\Delta t$

Where;

M = Mass flow rate

C_p = Specific heat

Δt = Temperature change of the air across the heating section

Hence, the forced convection heat transfer coefficient is obtained using $q_t = h.A\Delta T$

Where;

ΔT = log mean temperature across the heating section

The result of the convective heat transfer of h = 0.05 W/m^2k was obtained

TABLE OF CONTENT

List of Figure **Pages**

List of table **pages**

List of graphs pages