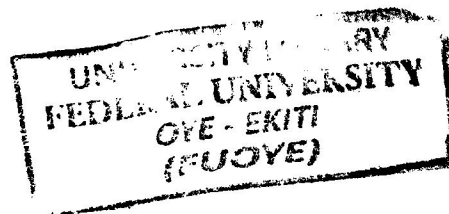


DESIGN OF A COOLING SYSTEM FOR AN EXISTING
FOOD EXTRUDER.

By For Food

in.

BY



POPOOLA, ESTHER AYOKUNNU

ABE/12/0822

DEPARTMENT OF AGRICULTURAL AND BIORESOURCES ENGINEERING
FEDERAL UNIVERSITY OYE-EKITI,
EKITI STATE, NIGERIA

NOVEMBER, 2017.

**DESIGN OF A COOLING SYSTEM FOR AN EXISTING
FOOD EXTRUDER**

POPOOLA, Esther Ayokunnu
ABE/12/0822

SUBMITTED TO

DEPARTMENT OF AGRICULTURAL AND BIORESOURCES ENGINEERING,
FEDERAL UNIVERSITY OYE-EKITI,
EKITI STATE, NIGERIA.

IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF
BACHELOR OF ENGINEERING (B.ENG.) IN AGRICULTURAL AND
BIORESOURCES ENGINEERING

NOVEMBER, 2017.

DECLARATION OF ORIGINALITY

This project is entirely my work and has not been copied in part or in whole from any other source except where duly acknowledged. As such, all use of previously published work (from books, journals, magazines, internet, etc) has been acknowledged within the main report to an entry in the References list.

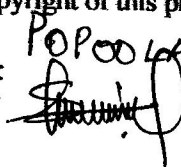
I agree that an electronic copy or hardcopy of this report may be stored and used for the purposes of plagiarism prevention and detection.

I understand that cheating and plagiarism constitute a breach of University Regulations and will be dealt with accordingly.

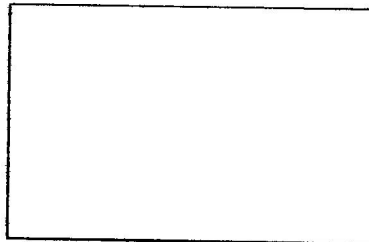
COPYRIGHT

The copyright of this project and report belongs to Federal University, Oye-Ekiti.

Signed:

POPoola ESTHER. A


Date: 13/12/2017



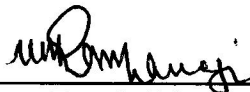
Office Stamp

DEDICATION

I dedicated this project to Almighty God for his provisions, inspiration and the wisdom he bequeathed on me throughout the period of this project and to my late parents, Pastor and Mrs. R.O Popoola, for their support and encouragement.

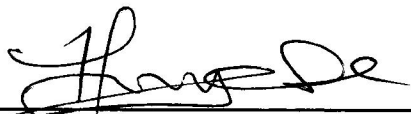
CERTIFICATION

This is to certify that **POPOOLA Esther Ayokunnu**, an undergraduate student in the Department of Agricultural and Bioresources Engineering, Federal University Oye-Ekiti with Matriculation Number ABE/12/0822, has successfully carried out and completed this project work in partial fulfillment of the requirements for the award of the Degree of Bachelor of Engineering in Agricultural and Bioresources Engineering. The work embodied in this report is original and has not been submitted in part or full for any other Diploma or Degree in this University or any other University.



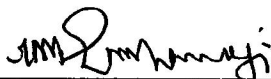
Engr. Dr. A. M. Olaniyan
(Supervisor)

Date 19.03.18.....



Engr. Dr. F. T. Fayose
(Co-Supervisor)

Date 31/11/17.....



Engr. Dr. A. M. Olaniyan
(Head of Department)

Date 19.03.18.....



Engr. Professor K. J. Simonyan
(External Examiner)

Date 30/11/17.....

ACKNOWLEDGEMENT

I appreciate God almighty the geometrician of the whole universe for his mercies throughout this work and for the success of my degree program. All glory belongs to him.

I appreciate my supervisor, Dr. F.T Fayose for her guidance and assistance on this project. Her helpful critics and comments that necessitate the good outcome of this project work. I am deeply grateful ma.

In addition, my co-supervisor and H.O.D. Dr. A.M Olaniyan, for his fatherly role during my course of study, God bless you sir.

Special thanks goes to my dearest parents; late pastor and Mrs. R.O Popoola for their indefatigable love they have shown me since my birth and for nurturing me in the way of the lord, I pray your souls will continue to rest in perfect peace.

With humility, I want to express my profound gratitude to my sponsorer and founder of Rose of Sharon Mrs. Folunsho Alakija, for her endless finance support, my parent in the lord pastor and Pastor Mrs. Oluwade, fellowship co-coordinators Mr. Osamoka, Engr. James, Dr. Mrs. Osakwe, and Dr. Mrs. Udububa. For their invaluable support, morally, financially, spiritually, may you all live long to reap the fruit of your labour in Jesus name (Amen).

I also appreciate my siblings Israel, Abigail, Noah, Ruth, Hannah, Gabriel and Zachariah, for their support and encouragement; I pray that you will all succeed in all your endeavors' and we shall all live to fulfill our destinies in Jesus name.

Finally, I appreciate my friends Oluwatobi Fatokun, Ibrahim Mutolib, Ijalana, Oladepo Oladimeji, Stephen and Luke. To my colleagues and other family members whose names cannot be mentioned here, I say thanks a bunch to you all and God bless.

ABSTRACT

Food extrusion is one of the easiest methods adopted by most industries to convert their paste raw material to a finished and desire shape based on the die of an extrusion machine. Extrusion technique is a process in food processing technology that combines several unit operations including mixing, cooking, kneading, shearing, shaping and forming. The machine that forces the mix through the die is an extruder and the mix is known as extrudate. The extruder consists of large, rotating screw tightly fitting with a stationary barrel at the end, which is a die. This project is borne out of need to control the heat generated by frictional dissipation of a cooking extruder on crops, since different crops has different temperature and rate at which heat is generated for each differs. To avoid burnt during the extrusion process, a cooling system is required to actualize the desire end product by controlling the temperature generated which can lead to burning, puffing of the raw materials and end products. The component of the cooling system, which include; radiator, heat exchanger, reservoir, water pump, fan, hose and distribution pipes.