BUSITEMA UNIVERSITY
Pursuing Excellence

FACULTY OF ENGINEERING

DEPARTMENT OF CHEMICAL AND PROCESS ENGINEERING

FINAL YEAR PROJECT

DESIGN AND CONSTRUCTION OF A MOTORIZED CHAPATTI ROLLING AND SHAPING (DIAMETER SHAPING) MACHINE

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BU/UG/2014/12

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ABSTRACT

Chapatti is a form of unleavened flat bread prepared from whole wheat flour dough and baked momentarily at a high temperature to ensure a rapid steam formation and an eventual puffing of the ready-to-eat meal and is a popular stable diet in many Ugandan households today, and an additional business for many small scale vendors in the country.

The purpose of this study was to design and construct a chapatti making system component for rolling/ sheeting and sizing(diameter shaping) of the chapatti dough specifically for small vendors, and households in Uganda so as to reduce on the body health problems like chest pain during rolling and also Labour and time wasted during the making and cutting of dough for balls first and rolling using the wood, increase on the throughput with uniform thickness, sizes/diameters of the chapatti thus increasing the production of chapattis and the profits for them.

The design of the various machine parts was carried out by analyzing forces acting on them. Force analysis led to selection of proper materials to withstand the forces to avoid failure. Stainless steels of various grades were the main materials recommended to be used because they are food grade, strong and durable. Engineering drawings of the various components were drawn before the various components were constructed and then machine parts fabricated. A fully functional prototype resulted after all the above operations. Testing of the prototype was carried out and the figures revealed that the machine was **69.4 %** efficient. The maize grain cleaner has a total cost of **1,039,200 *UGX*** . The cost evaluation analysis of the project was based on the net present value method with NPV of **22,347,694 UGX** over a period of five years and this resulted into a profitability index of 21.5.

DECLARATION

I **Mwanje Lamathan** declare to the best of my knowledge that the work presented in this report is my own and has never been presented to any University or higher institute of learning for any academic award.

Reg no...BU/UG/2014/12.....

Signature.....

Date...23/05/2018.....

APPROVAL

This report has been submitted to the Department of Chemical and Process Engineering for examination with approval from the following supervisors:

Mr. Kavuma Chris

(MAIN SUPERVISOR)

Signature.....

Date.....

Mr. Kimera David

(CO – SUPERVISOR)

Signature.....

Date.....

DEDICATION

To my dear parents, my father Mr. Kizza Muhammad and my sweet mother Mrs. Nabakooza Rehemah, my dear uncle Mr. Ziraba-Muzaale Ibrahim, my lovely brothers, sisters and friends. May the almighty ALLAH grant them "good" life.

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My sincere thanks go to the Almighty ALLAH for giving me strength, good health, wisdom, and protection throughout the preparation of this work. And I pray that He never leaves me on my own for even a blink of an eye.

I also sincerely thank my mother and siblings, Rehemah Namwanje, Kintu Hamis, Ssemujju Ismail and Nasande Esther plus also my best friend Gumisiriza Jane for being there for me in all ways whenever I needed their attention.

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TABLE OF CONTENT

LIST OF FIGURES

LIST OF TABLES

1.0 Chapter one

1.1 Introduction

This chapter briefly gives the background to the study topic, the problem statement, the objectives of the project, the reasons as to why the project should be carried on (justification), giving its purpose and finally the scope or limits of the project.

1.2 Background

Chapatti is a popular stable diet in many Ugandan households today, and an additional business for many small scale vendors in the country. It is a form of unleavened flat bread prepared from whole wheat flour dough and baked momentarily at a high temperature to ensure a rapid steam formation and an eventual puffing of the ready-to-eat meal. According to ***(Pastukhov & Dogan, 2014)***, the process of its making involves soaking whole wheat flour with a regulated amount of water to form dough in a dynamic process that monitors the continuous changing of viscoelastic properties of the recipe.

During large scale production in the Milling and Baking industry, chapattis are prepared under high quality production management chains that mainly preserve an optimum rheology of dough. This rheology involves maintaining a consistent viscosity and elasticity of the dough as a key knowledge that determines the evolution of quality food products like chapatti and other wheat flour products. The dough is normally given an atmospheric contact time of 15-30 min before being rolled into balls of about 5g, and then sheeted to a thickness of about 2-3 mm – a process normally done by estimation. The dough balls are then sheeted to diameters of 12 -15cm (- still by estimation) and then baked on a hotplate at 220°C. The sheets are finally puffed on a live flame for few seconds. It is generally consumed hot along with other adjuncts. Complete and full puffing, soft and pliable textures as well as wheatish brown color with dark brown spots are some of the important attributes of good quality chapatti.

The quality characteristics of chapatti are mainly governed by the quality of wheat used and the processing conditions employed for converting it into flour (Leelavathi, et al., 1986). Previously, researchers have reported on substitution of wheat chapatti with rice bran can be used in improving the nutritional and therapeutic status of diabetic patients (Singh, et al., 2013). However, there are reports to indicate that wheat having higher protein contents (>12%) are suitable for chapatti making, indicating the importance of quality or nature of proteins present in wheat in determining chapatti making quality (Srivastava, et al., 2003).

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