BUSITEMA UNIVERSITY
Pursuing Excellence

FACULTY OF ENGINEERING

DEPARTMENT OF CHEMICAL AND PROCESSING

ENGINEERING

FINAL YEAR PROJECT REPORT

DESIGN AND CONSTRUCTION OF A CENTRIFUGAL EGG BREAKING MACHINE

BY

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ABSTRACT

An egg (ovum) is one of the world's most important and useful poultry products in East Africa since it's a source of food and income.

Eggs are composed of three main parts: eggshell, egg white (albumen) and yolk, representing 9.5%, 63%, and 27.5%, respectively, of the whole egg.

The major operations done on eggs during egg processing are mainly cleaning, breaking and separation of the required egg components. The main objective in egg processing is usually to extract the inside liquid components from the whole egg for the manufacture of various products such as bread, cakes etc.

In Uganda today, egg breaking and separation by both large scale, medium scale and small-scale egg processors is mainly accomplished by the use of hand held knives method. This method leads to time wastage during the process, leading to delays in production due to long production time thus making the process hard due to the low capacity. It also leads to the escape of eggshell particles into the egg liquid, high risks of contamination by the workers, occupies a large production space since it requires a lot of individuals to work on large numbers of eggs in a given time thus high labor costs. Therefore, this project was carried-out to design and construct a centrifugal egg breaking machine which was constructed to resolve these problems faced by egg processors. The machine breaks the eggs, separates off the eggshells and finally allowing the egg liquid to flow into the collecting container by gravity without mixing the components. The NPV value obtained was positive hence the project is highly viable. The centrifugal egg breaking machine was constructed running at a capacity of 50 L/hr, with an egg liquid yield of 93.6%, extraction efficiency of 77.6% and an extraction loss of 5.3% compared to that of knife method of 31.7L/Hr capacity, 85.8% egg liquid yield, 74.9% extraction capacity and 12.9% extraction loss. In addition, a wooden stick rod was selected to overcome clogging in the auger pipe, as the eggshells tend to rotate about the center of rotation of the auger.

DECLARATION

I **OKWANG STEPHEN** solemnly affirm that this project report is the work of my hands and has never been submitted to any university, college or any other Institution for any academic award.

Date: 22/05/2018

Signature:.....

APPROVAL

Main Supervisor: Ms. NJUKI HOPE

Date: ……..

Signature: ……

Co-Supervisor: MR. KIYEMBA ANDREW

Date: ……

Signature: ……

DEDICATION

I dedicate this work to my Parents Mr. Hudson Suubi and Mrs. Mercy Suubi for their tireless support towards my studies and supporting me financially, emotionally, psychologically and spiritually during the course of training.

May the almighty God bless you.

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FAO- Food and Agriculture Organization

MAAF- Ministry of Agriculture, Animal Industry and Fisheries

NAADS- National Agriculture Advisory Services

UIRI- Uganda Industrial Research Institute

UNBS – Uganda National Bureau of Standards

WHO- World Health Organization

CHAPTER ONE:

1. INTRODUCTION

This chapter describes the background information of the project, the problem statement, and justification of the study, purpose, objectives and the scope of the study. The problem statement describes the problem of the study and identifies potential causes and a solution. The justification describes the importance of the project and the specific objectives will achieve the main objectives.

1.1 BACK GROUND OF THE STUDY

An egg(ovum)(Iwata, 1955) is one of the world's most important and useful poultry products in East Africa(Guèye, 2000) since it's a source of food and income.

Eggs are composed of three main parts: eggshell, egg white(albumen) and yolk, representing 9.5%, 63%, and 27.5%, respectively, of the whole egg(Ricklefs, 1977). The yolk is located in the centre of the egg, surrounded by an albumen layer, which in turn is covered by eggshell membranes and finally a hard eggshell (Hincke et al., 2012) .

The government of Republic of Uganda through NAADS under MAAF initially spearheaded the production of poultry products (Kassie, Shiferaw, & Muricho, 2011). Eggs are of a great importance to the people of Uganda in form of both economic and nutrition values. Some of the products of eggs include; Rolex, cakes, bread, egg powder, egg liquer etc. Therefore, Uganda has merged to be a poultry product surplus area and eggs one of the main products produced in most parts of the country with the main producing districts including; Mukono, Masaka, kampala, Rakai, Mbale, Kayunga and some other districts(Hunter, Bulirwa, & Kisseka, 1993)

In Uganda, Hotels, restaurants, bakeries and some other small scale food processing firms have majored in egg processing.

Despite the existing egg breaking machines in the agro processing industry, it is noticed that the available ones are too expensive especially for small firms which can't afford them(Li, Dhakal, & Peng, 2012) and consume a lot of power(Niu, Wang, & Wu, 2010). Egg processing in Uganda is mostly done on a small and medium scale, which involves the use of equipment and tools like knives for breaking and containers for collecting the egg liquid, followed by the use of stirring tools like spoons for mixing. The use of knives is usually feasible when breaking a few eggs, but

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