BUSITEMA UNIVERSITY
Pursuing Excellence

FACULTY OF ENGINEERING

DEPARTMENT OF CHEMICAL AND PROCESS ENGINEERING

AGRO PROCESSING ENGINEERING PROGRAMME

FINAL YEAR PROJECT

DESIGN AND CONSTRUCTION OF A GAS HEATED MILK PASTEURISER

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ABSTRACT

This project comprises of five chapters; Chapter one presents background of milk production in Uganda and value addition activities in the milk value chain. The problem considered in this study is presented in the problem statement and the justification, objectives and scope and limitations of the study are also presented in this chapter.

Chapter two discusses the details of the various aspects involved in milk production, chemical composition, the existing methods of pasteurization. In relation to the objectives of this study, the methods and procedures that will be followed in order to come up with the design of a gas heated milk pasteurizer, fabrication processes involved, Material selection, test for performance and evaluation of the prototype were also handled in chapter three.

Chapter four includes the results and discussion based on the tests was carried out that discovered that the average time taken to pasteurize milk up to 84^0C was 45 minutes and also that the average time taken to cool the pasteurized milk to 25^0C is 30 minutes, Additionally the viability of the project was tested and it was found viable since the net present worth was greater than zero (491200 Uganda shillings)

Chapter five enlists the recommendations and conclusions derived from the designed and constructed gas heated milk pasteurizer. Recommendations include the Provision of an improved insulation in order to completely reduce heat losses so as to use energy efficiently and effectively.

Appendices are attached at the end of this document which includes the photo during the testing of the prototype.

DEDICATION

I dedicate this project to the family of Mr. ELIAB BEITAZYA TUMWIJUKYE and the family of Mr. EDISON TUMWEBAZE for the love , care and guidance.

DECLARATION

I NINSHABA PATRICIA declare that the work in this project was carried out in accordance with the Regulations of Busitema University. The work is original except where indicated by special reference in the text and no part of the project has been submitted to any other university for examination and degree award. Any views expressed in the project are those of the author and in no way represent those of Busitema University.

SIGNED: ..... DATE: 20th/05/2015

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With great honor, I thank to the management of Busitema University, faculty of engineering for considering final year projects as one core activity for strengthening engineering skills in their students. Thanks to the Head of Department Agro Processing Engineering, Dr. Catherine Wandera and all the lecturers, without their lectures and general guidance, inter-relating theory with practicals would be impossible.

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APPROVAL

This project was compiled and submitted to the Department of Chemical and Processing Engineering of Busitema University under the supervision and approval of:

Main supervisor

Dr. Catherine Wandera

Signature .....

Date .....

Co supervisor

Mr. Joseph Lwanyaga Ddumba

Signature .....

Date .....

LIST OF ACRONYMS

AEATRI	Agricultural Engineering and Appropriate Technology Research Institute
GDP	Gross Domestic Product
NAADS	National Agricultural Advisory Services
DDA	Dairy Development Authority
FAO	Foods and Agriculture Organization
HTST	High temperature short time
NPW	Net Present Worth

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CHAPTER ONE: INTRODUCTION

1.1 Background

In Uganda, the livestock sub sector contributes 7%-9% of the national gross domestic product (GDP) and diary is estimated to contribute up to 45% of the GDP attributed to the livestock sector (FAO, 2004). Milk is envisaged as a major protein source that can improve nutrition in Africa (Meyer and Denis, 1999); the most commonly consumed types of milk in Uganda include: unprocessed raw milk, boiled unpackaged milk, and processed packaged milk (pasteurized and UHT). Uganda's dairy sub-sector has had a steady growth in milk production since 1990, from about 500 million litres in 1990 to 1.6 billion in 2010 (Dairy report, 2012): the diary sub-sector plays an important role as a source of food, income and employment. Ugandan milk production is largely dominated by small-scale farmers who own over 90% of the national cattle population (Okidi et al, 2004) and up to 60% of the rural households keep mostly indigenous cattle (NAADS, 2002). Dairy farming in Uganda is concentrated in 42 districts found in the cattle corridor which stretches from the South Western region through central to north eastern regions. The south western region - the highest milk producing region - producing 1.38 million litres of milk per day and contributing about 36% of the milk production in the country and in this region 966000 litres per day is available for marketing (DDA, 2007/08). Moreover, more than 80% of the milk produced in Uganda is consumed without being processed; approximately only 20% of milk is left to be processed and packaged before marketing (New Vision, 28 June 2013) which means that the supply chain for unprocessed milk is more voluminous. Post-harvest milk loss is a major constraint affecting milk production in Uganda; post-harvest milk losses encountered at various stages of the milk supply chain, include losses at the farm, losses and losses at the processing plants.

Milk contains vegetative microorganisms which are responsible for milk spoilage. Pasteurization is a temperature treatment of milk and other food through which the microorganisms in the milk are destroyed; therefore, pasteurization makes the food product safe for human consumption and promotes biological stability of food thereby improving its shelf life. Post-harvest milk losses are lower in the formal milk market due to the fact that such milk is produced in areas with better-developed collection; processing and marketing infrastructures and better milk handling practices are used to prevent milk contamination and spoilage. At processing plants, milk losses are

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