



**BUSITEMA
UNIVERSITY**
Pursuing Excellence

**FACULTY OF ENGINEERING
DEPARTMENT OF CHEMICAL AND PROCESS
ENGINEERING
AGRO PROCESSING ENGINEERING PROGRAMME**

**FINAL YEAR PROJECT REPORT
DESIGN AND CONSTRUCTION OF A SMALL SCALL TOMATO
HUMIDIFIER**



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MAY 2015

ABSTRACT

Long shelf life of tomatoes during storage can be induced by reduction in the post-harvest losses. These losses are as a result of factors such as high temperature and low relative humidity, Pathological infection and mechanical injuries caused during post-harvest handling of tomatoes.

The purpose of the study was to develop a humidifier for tomatoes that maintains moisture content, controls storage temperatures, keeps freshness and maintains the quality of tomatoes as a way of extending the shelf life.

The study objectives were to design the components of the humidifier, construct the prototype, test for the performance of the prototype and carry out an economic evaluation of the humidifier. These were done and achieved by using the knowledge of engineering drawing and solid edge software to come up with the sketches of the drawings for the design. Measurements were done using tape measures and square rules so as to come up with the required material sizes and dimensions from which the construction was done and they included joining through hammering and tightening of the wire nettings.

The study was limited to designing, constructing, testing for the performance, and economic evaluation of a humidifier. The tests carried out were temperature tests for both ambient air and moist air in the humidifier and the physical tests on tomatoes stored in the ambient and the humidifier. Results for testing were tabulated for different times of the day to evaluate the performance of the humidifier by calculating the humidifying efficiency. Discussion, conclusion and recommendations were derived from the testing results and finally an economic analysis of the humidifier was performed through which a payback period was used as the evaluation method.

DECLARATION

I Azedi Byangu hereby declare to best of my knowledge, that this project report is an outcome of my original work and has never been submitted to any institution of learning for an academic award.

Signature 

Date 20th/05/2015



APPROVAL

This project report has been submitted to the faculty of engineering for examination with approval of my supervisors:

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Date..... *15/06/2015*

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Signature.....

Date.....

DEDICATION

I dedicate this report to my parents Mr.Masanghe Asuman and Mrs.Namugawe Zurah in appreciation for their selfless care and support provided to me since childhood, and for the spirit of hard work, courage and determination instilled into me throughout the entire process of my academics.

ACKNOWLEDGEMENT

Firstly my acknowledgment goes to my Creator who is the source of my life and without Him I'm nothing.

Secondly Special thanks go to the entire team of APE department, Faculty of Engineering, Busitema University especially to my supervisors, Dr. Catherine Wandera and Mr. Joseph Ddumba Lwanyaga whose skills, advice, knowledge and suggestion greatly helped me throughout the whole project development session.

Finally am indebted to my dear brothers, sisters, classmates and friends to whom I extend sincere appreciation for their guidance and support.

LIST OF ACRONYMS/ABBREVIATION

- 1) FAO - Food and Agriculture Organization of the United Nations
- 2) O₂ - Oxygen
- 3) CO₂ - Carbon dioxide
- 4) ULO - Ultra -Low Oxygen
- 5) Eg - For example
- 6) MC - Moisture content
- 7) APE - Agro-Processing Engineering
- 8) RH - Relative Humidity
- 9) db - Dry Bulb temperature
- 10) wb - Wet Bulb temperature
- 11) °C - Degree Celsius
- 12) CAS - Controlled Atmosphere Storage

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CHAPTER ONE: INTRODUCTION

1.0 INTRODUCTION

This chapter presents the introduction to the study by underscoring the problem to be addressed by the study. The objectives and justification of the study are also presented in this chapter.

1.1 Background of the study

Tomatoes are important produce for domestic use and a source of income for farmers and traders in all parts of Uganda (Naika *et al.*, 2005). Tomatoes have a great potential to improve the nutrition and health of consumers as they are good sources of vitamins, minerals and proteins needed for proper functioning and development of the human body (Wills *et al.*, 1998). Despite the importance of tomatoes, they have a problem of short shelf life. Large quantities of tomatoes produced during the main production season are usually left to deteriorate as they cannot be kept longer and farmers are forced under the circumstances to give their commodities out at very low prices (Yamaguchi, 1983). In the market areas tomatoes are packed in baskets which results into over exposure of the produce to the weather thus leading to quick deterioration and contamination of the produce (Adegoreye *et al.*, 1990). Additionally, at the production level little is done about fresh storage of produce because farmers do not have adequate storage facilities to reduce losses and they have limited capital to acquire and use cold storage facilities. (Sablani *et al.*, 2006). In certain situations market women have no alternatives than to throw away vegetables they could not sell in order to avoid paying on extra cost of transporting those vegetables back home and cannot store till the next market day.

Refrigeration and controlled atmosphere storage of the tomatoes is in practice to reduce losses and increase shelf life but instead results into changes in external and internal qualities of tomatoes. Traditionally, tomatoes have been processed by sprinkling water to extend the shelf life and keep them fresh beyond few days when they are in season (Kordylas, 1991). Therefore, humidification of tomatoes in an enclosed space is an alternative that prolongs their usefulness and provides wider selection of the tomatoes throughout the year which helps in orderly marketing and may increase the income of the farmer.

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