BUSITEMA UNIVERSITY

Pursuing Excellence

FACULTY OF ENGINEERING

DEPARTMENT OF CHEMICAL AND PROCESS ENGINEERING

DESIGN AND CONSTRUCTION OF A TWO STAGE MEAT ROASTER

BY

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A final year project report submitted to the Department of Chemical and Process Engineering as a partial fulfillment of the requirements for the award of Bachelor's Degree in Agro-Processing Engineering

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ABSTRACT

Meat is a basic portion of sound and all-round balanced diet due to its nutritional richness. Meat is a valuable wellspring of high natural quality protein and also other B complex vitamins, zinc, selenium, iron, vitamin B12 and phosphorus. Offal meats like liver are also vital sources of vitamin A and folic acid.it is mainly derived from domestic animals and poultry such as chicken's chickens, sheep, pigs and cattle.

The quality of meat products processed by the existing method mainly used by street venders is found to be not good due to difficulties in maintaining the variations of temperature, which results in products with bloodstains at the core of the roasted meats. This result in meat contamination by microorganisms due to failure to denature them.Roasting is one of the cooking methods that uses dry heat in which hot air envelops the food cooking it evenly on all sides with temperatures at least 150^0C from an open frame, oven or other heat source. This process can enhance flavor through caramelization and milliard browning on the surface of the food

The objective was to design and fabricate a machine that first steams meat to reach the denaturing temperature(70^0C) of microorganisms at the core of the meat cubes and then dry roasting follows to attain that flavor and the browning of the roasted surface. The performance of the prototype was done mainly by analyzing the quality of cook by use of water solubility index and water solubility index and also determining the microbial safety. After testing the quality of the cook,it was found that WAI was 6.8% which was good according to standards and WSI was 3g per 10g of the finished products

Design and construction of the various components of the maize huller was carried out by analyzing forces acting on them so that components don"t fail during operation. Force analysis led to selection of proper materials to withstand the forces to avoid failure. Engineering drawings of the various components of the roaster were designed and drawn before the various components were constructed. Then machine assembly was done last according to the engineering drawings and the performance of the machine was tested.the economic evaluation of the prototype was carried out using profitability index and it was found to be 20% which high

In summary, This prototype development of this two stage meat roaster, if implemented, will provide a great remedy to the challenges faced during local roasting processes of meat in various parts of Uganda.

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I thank the almighty God who has enable me to make it through up to this point in life and in my academics.

My sincere thanks also goes to my beloved mother Mrs. Aidha Nairuba, my father Mr. Kiige Alfred and the entire family for their un-conditional support given to me though out my life.

I thank my supervisors Mr. Sserumaga Paul and Mr. Ashababahebwa Ambrose for their help in writing this final report and big thanks goes to the entire department of Agro processing engineering for the knowledge imparted to me up to this point.

Thanks goes to the friends, my fellow students of Bachelor of Science in Agro processing engineering class of 2014/2018 for they have boosted me spiritually, academically, socially and in very many other ways. May the almighty God bless you abundantly!

DEDICATION

To my beloved father Mr. Kiige Alfred ,my mother Mrs. Nairuba Aidha ,my sister Mrs.Mukanza Suzan ,and the entire family members and friends for the strength, encouragement and prayers you have dedicated to me, may the almighty God bless you all!

I dedicate this work report to my beloved parents, my Father Mr.kiige Alfred and my mother Mrs.Nairuba Aidha ,my sisters Mrs. .Mukanza Suzan and Mrs. Mujungu Lilian and to all my brothers for the support ,strength ,encourage and prayers toward my successive completion of my four years of study at Busitema University indeed you have worked tirelessly to ensure that I succeed in my studies.

May the almighty God reward you abundantly.

DECLARATION

I **Kunya John**, hereby declare to the best of my knowledge, that this project report is an outcome of my original work and that it has never been presented to any university/higher institute of learning for any academic award.

APPROVAL

This research final report has been submitted to the Department of Agro-Processing Engineering for examination with approval from the following supervisors:

Mr. Sserumaga Paul

Signature.....

Date.....

Mr. Ashabahebwa Ambrose

Signature .....

Date .....

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CHAPTER ONE

INTRODUCTION

This chapter consists of the project background,problem statement,purposes of the study,justification ,objectives and the scope of the proposed wet and dry meat roasting machine

1.1 BACKGROUND

Meat is a basic portion of sound and all-round balanced diet due to its nutritional richness. Meat is a valuable wellspring of high natural quality protein and also other B complex vitamins, zinc, selenium, iron, vitamin B12 and phosphorus. Offal meats like liver are also vital sources of vitamin A and folic acid.it is mainly derived from domestic animals and poultry such as chicken's chickens, sheep, pigs and cattle. Cattle are the main source of meat in the country and are reared on rangelands which occupy 84 000 km². The greatest concentration of livestock is found in the "cattle corridor", extending from South-Western to North Eastern Uganda. This corridor covers the districts of Ntungamo, Mbarara, Mpigi, Kiboga, Luwero, Apac, Lira, Soroti, Kumi, Mbale, Moroto, and Kotido (Brief, 2005)

However effective demanding of meat roasts is gaining potential in the urban areas and the local market is available and it is growing due to increase in rate of urbanization. For meat to be utilized as food, it need to be cooked using methods that does not affect the quality of the meat products, poor cooking methods leads to production of products of poor quality thus resulting into low market value. Meat and meat-based products are cooked before being eaten, this helps in destroying food borne pathogens, assuring microbial safety and achieving meat quality. Further more,cooking also extends the shelflife of the meat products to be subjected to further processing into different products.it is mainly done using methods like pan frying,open frame grilling,boiling,steaming roasting and other methods with the help of open fire or an oven.Roasting is one of the cooking methods that uses dry heat in which hot air envelops the food cooking it evenly on all sides with temperatures at least 150^0C from an open frame, oven or other heat source. This process can enhance flavor through caramelization and milliard browning on the surface of the food

The roasting of meat in uganda on small scale is mainly carried out by use of charcoal grill method,pan frying and convection ovens,however charcoal is the leading heat source used which

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