



**BUSITEMA
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Pursuing Excellence

FACULTY OF ENGINEERING

DEPARTMENT OF CHEMICAL AND PROCESS ENGINEERING

DESIGN AND CONSTRUCTION OF A DUAL POWERED MEAT GRINDER

BY

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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 one of the most essential nutritious food item needed for human consumption from which high quality proteins, minerals and essential vitamins are derived. However, certain categories of consumers such as the children, elderly and sick people might not be able to provide the requisite biting force for tough meat tissues. Thus they would only be able to consume meat in their grinded form. In order to address this problem, it becomes necessary to have a meat grinding machine; in order to ensure good and easy digestion of the meat in their system. This paper presents the design of an efficient single meat grinding machine with both manual and motorized mode of operation, which can be used at anywhere (urban and rural area) and at any time (during electric power outage). This design provides the kinematic arrangement of forces, materials selection and proportion of parts to ensure maximum strength and functionality of the machine. To avoid failure of the machine, the working stress (21MN/m^2) of the machine is kept within the value of its ultimate stress (30MN/m^2). The dual powered meat grinder was constructed with locally available materials. The performance parameters obtained for an expected rotational speed of 420rpm when motorized and 40rpm when manually operated indicated an efficiency of 75% and 51% respectively. The production rate of the machine was 98.4kg/h when motorized and 60kg/h when manually operated.

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. The meat grinder has a total cost of 1100000Ugx which includes all the taxes, cost of material, machinery and hired labor to construct the machine plus overhead costs. The cost evaluation analysis of the project was based on the payback period method and the Net present value method. The project was evaluated to breakeven in 3 months.

DECLARATION

I **KALEMBE ESTHER** declare to the best of my knowledge that this project proposal is as a result of my research and effort and it has never been presented or submitted to any institution or university for any academic award, unless otherwise referenced.

DATE 23rd / 05 / 2018

SIGNATURE 

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APPROVAL

This proposal has been submitted to the department of Chemical and Process Engineering for examination with approval from the following supervisors

Mr. ANDREW KIYEMBA

SIGNATURE

DATE.....

Mr. KILAMA GEORGE

SIGNATURE

DATE

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

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CHAPTER ONE

1.0 INTRODUCTION

1.1 Background of study

Livestock production in Uganda contributes 7-9% of the total GDP and 17-19% of agriculture GDP. Cattle are the main source of meat in the country and are reared on rangelands which occupy 84,000 km². The cattle corridors extend from Moroto and Kotido in North East through central Uganda to South West of Mubende, Masaka Rakai and Mbarara.(UIA, 2014)

Although beef production in Uganda has been growing at a rate of 5% each year over the past decade and a half, its full economic potential has not been tapped. There are 7 small scale meat processing plants in Uganda processing between 300-700 kg of processed meat products per day. All these processing plants are privately owned mostly by foreigners.(Behnke & Nakiryia, 2012) These plants include; Uganda Meat Industries, Lubowa Investments Limited, Meat Process (U) Ltd, Farmers Choice a beef, poultry and pork producing company, Sembeguya Estates, Ugachick and Biyinzika Enterprises Ltd.

The rising demand for beef in Uganda is mainly a consequence of the fast progression of urbanization and the tendency among city dwellers to spend more on food than the lower income earning rural population(Africa & Product, 2015.)

Meat is one of the most essential nutritious food item needed for human consumption from which high quality proteins, minerals such as iron and essential vitamins such as B₁₂ are derived. Meat muscle is made up of fibers bound together with connective tissue that are mainly linked to other group of muscles or connected directly to the bone structure.(Williams, 2007)

Meat grinding is the process of reducing meat size to either coarse or fine particles. Meat grinding helps to breakdown the fibers and connective tissue that is hard so as to simplify the cooking process and digestion.

In Uganda, products of ground meat are still largely a reserve delicacy for the urban elite communities. Growth in consumption of processed meat products is often more visible among middle-class consumers.

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