

**BUSITEMA  
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*Pursuing Excellence*

**FACULTY OF ENGINEERING  
DEPARTMENT OF CHEMICAL & PROCESS ENGINEERING  
BSc. AGRO-PROCESSING ENGINEERING**

**DESIGN & CONSTRUCTION OF A MOTORIZED TOMATO PULP AND SEED  
EXTRACTION MACHINE**

By

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## ABSTRACT


Tomato (*Lycopersicon esculentum*) is one of the significant fruit/vegetable crop popularly consumed almost in every country of the world. They are consumed fresh in combination with salads or used in cooking as a recipe. Therefore, the commercial value of the tomato lies in its processing. Tomatoes are important for health and rich in several good compounds. They give protection and reduces the risk of contracting chronic degenerative diseases. For example, nutritional values like lycopene, a food component known to reduce the incidence of prostate cancer, heart and age-related diseases, and also provide good quantities of vitamins A, C and E. Therefore, the commercial value of the tomato lies in its processing. Tomato processing in Uganda is still a minor activity due to lack of funds and appropriate technology inspite of its high economic potential in the country. Local farmers extract seeds from tomato by use of hands which is associated with contamination, injuries and drudgery. For easy separation, the pulp is left to ferment for at least 1-2 days and this puts pulp to wastage and produces large effluent during the washing process. The large and small industrial units engaged in processing tomatoes in various forms use a temperature gradient of 65<sup>0</sup>C to 70<sup>0</sup>C to isolate pulp from the peel destroying the seed and thus sacrificing the quality of the pulp. The motorized tomato pulp and seed extractor therefore separates the pulp, peels and seeds in a single process to present the above challenges.

Conceptualization of the machine involved two units; the squeezing unit and the rubbing unit. Different components of the machine were designed basing on the physical, mechanical and chemical properties of the tomato, the components include; the feed hopper, screw conveyor, shaft, rubbing unit, pulp collection chamber, main frame. From the designs, the squeezing, conveying and the rubbing unit operate at a speed of 700rpm with a total maximum transmitted power requirement of 2HP.

After fabrication, the performance and economic analysis of the machine were performed in terms of extraction efficiency and extraction loss, resulted into 88% extraction efficiency and 6.6% losses in peels and other areas. Machines total cost; Ugx.604500, cost of extraction; Ugx 2056.8, Breakeven units; 39.8kg of pulp, monthly income; Ugx. 436728 and pay back-period of 1.4years.

## DECLARATION

I hereby declare that the contents of the synopsis, "design and construction of a tomato seed and pulp extraction machine" are product of my own research and no part has been copied from any published source (except the references, standard mathematical or genetic models/equation/formulate/protocols etc.). I further declare that this work has not been submitted for award any other diploma/degree. The university may take action if the information provided is found inaccurate at any stage

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## APPROVAL

This project proposal is submitted to the Faculty of Engineering for examination with approval of my supervisors and the contents are satisfactory for the award of the degree

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## DEDICATION

This report is dedicated to my beloved parents Mr. MUDOMA MICHAEL and Ms. NAMBOOZO JOYCE in appreciation for their selfless care and unflinching support provided to me since childhood, and for the spirit of hard work, courage and determination instilled into me, which attributes I have cherished with firmness and which have indeed made me what I am today.

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## ABBREVIATIONS AND ACRONYMS.

**MS**- Mild steel.

**FAO** – Food and Agricultural Organization

**HP** – Horse Power.

**ROCI** – Return On Capital Invested.

**NPV** - Net Present Value

**$\rho$**  - Density

## CHAPTER ONE

### 1.0 INTRODUCTION

This chapter consists of the background, problem statement, justification, objectives of the study, purpose of the study and scope of the project.

### 1.1 BACKGROUND

Tomato (*Lycopersicon esculentum*) is one of the significant fruit/vegetable crop popularly consumed almost in every country of the world (Naika *et al.*, 2005). They are consumed fresh in combination with salads or used in cooking as a recipe. Their production in Uganda contributes to economic development and poverty alleviation because it is a source of foreign exchange earnings for economic growth over the last 5 years (Sonko *et al.*, 2005). About 3,000 small-scale farmers grow fresh fruits and vegetables for export with more than 20,000 smallholders growing vegetables for income (Sonko *et al.*, 2005). Tomatoes are consumed either fresh or as processed products (Gary and Tchamitchian, 2001). And annually planted on more than 4.5 million ha worldwide (Food and Agricultural Statistics, 2006). Tomatoes are consumed by about 3 million households in every meal in almost every district of Uganda (Mukiibi, 2001; Mwaule, 1995). Tomatoes are important for health and rich in several good compounds. It is also believed that they give protection from or reduces the risk of contracting chronic degenerative diseases (Meester, 2007). The districts of Kasese, Kabale, Mbale, Kapchorwa, Mubende, Masaka, Mpigi, Wakiso and Mbarara (Kennedy, 2008) have the largest area of tomato production. However, tomatoes are highly perishable and need to be processed and preserved for quality products. Lack of available quality of seeds is one of the important reasons for low tomato production in the country.

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