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FACULTY OF ENGINEERING

DEPARTMENT OF CHEMICAL AND PROCESSING ENGINEERING

AGRO-PROCESSING ENGINEERINGING PROGRAMME

FINAL YEAR PROJECT REPORT

Development of a manually operated beverage filling machine

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EXECUTIVE SUMMARY

Uganda is one of the best fruit producing nations in Africa. Fruits are a source of income and very vital for human health which calls for their processing into other forms like juices for continuous supply throughout the year together with other beverages. During packaging of beverages, small scale companies, outlets and restaurants normally use rudimentary methods which are time wasting, tiresome, dangerous, prone to contamination and lead to both qualitative and quantitative losses. This in turn makes such companies fail to be certified by UNBS and gives a bad impression to the consumers. Therefore, the objective of the study was to design, develop a manually operated beverage filling machine for small scale beverage producing companies and individuals which would reduce on the quantitative and qualitative losses. The design of the various machine parts was carried out by analyzing forces acting on them and the working environment of each part among other considerations. These considerations led to selection of proper materials to withstand the forces to avoid failure and also make the machine last longer. Steels of various grades were the main materials used because they are food grade, strong and durable. Engineering drawings of the different components were drawn before construction of the components. Then prototype assembly was done according to the engineering drawings. A fully functional prototype resulted after all the above operations. The prototype was tested and it had efficiencies of 63.3% based on the design capacity and 95.37% based on the filling accuracy. The machine had a maximum production cost of 861500shs and a projected payback period of three months of production. The results for the design were discussed and; conclusions about the specific objectives were made, and recommendations for further work were also stated.

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Finally, I thank all my friends and fellow Agro Processing Engineers for all the support and advice the have given me during my report writing.

DEDICATION

To my dear parents, my dad the late Mr. Mukasa Abdullah and my sweet mother Mrs. Mukasa Faridah, my lovely siblings and friends. May the almighty ALLAH grant them "good" life.

DECLARATION

I **Kibirige Ali** declare to the best of my knowledge that the work presented in this report is my own and has never been presented to any University or higher institute of learning for any academic award.

Signature.....

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CHAPTER ONE: INTRODUCTION

1.0 INTRODUCTION

This chapter is about the background to the study, the problem to be addressed, the justification of the problem, objectives and the scope of the study.

1.1 Background of the study

Uganda is one of the best fruit growing nations in Africa. The country is suitable and has abundant potential to produce fruits like mangoes, citrus, pineapples, tomatoes among others. This is because of the fertile soils and conducive climate that guarantee fruit and vegetable production for the greater part of the year (KASAJJA, 2001). Fruits are not only a source of income to the farmers and the fruit processing industry but they are also essential in our diet. Freshly squeezed juice from fruits and vegetables is an excellent source of minerals and vitamins that catalyze chemical reactions occurring in the body. These enzymes also produce the energy needed for digestion, absorption, and conversion of food into body tissues. Fruit juices also have the ability to promote detoxification in the human body by cleansing it especially those with high acid for example; Tomatoes, pineapple, and citruses such as oranges, red grapefruits, and lemons. Fruits have a lot of vitamins like vitamin A (especially apricots and cantaloupe) and vitamin C (especially citrus fruits like orange and grapefruit). These two vitamins help heal wounds, assist night vision and create a beautiful skin look. Fruits also have a high fibre content. Fibre helps the stomach digest food and may help to reduce cancer. The antioxidants present in the fruits also help to protect the body from free radicals since high levels of free radicals in the body contribute to heart disease. Fruits also contain sugars such as glucose, sucrose, and fructose varying in different fruits (Steminetz. K. A, et al, 2006).

On that note therefore, fruits need to be processed so as to increase their shelf life and ensure that they are constantly supplied throughout the year. Many small scale fruit processing companies have arisen in Uganda, processing fruits into various products such as juice, packed fruits, fruit pulps among other beverages. Some of the prominent small scale companies in Uganda include JAKANA Foods Ltd., RECO Industries Ltd., and other smaller companies like Asante beverages, PISTIS in Kampala, ELIM juice processors in Luwero, ANESQUEEZER juice producer in

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