BUSITEMA UNIVERSITY

FACULTY OF ENGINEERING

DEPERTMENT OF AGRO-PROCESSING ENGINEERING

DESIGN OF A PHYSICAL PURIFICATION SYSTEM FOR LOCALLY PRESSED VEGETABLE OIL

By

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ABSTRACT

Vegetable oils find a wide variety of uses in consumer products including use as food additives, lubricants, solvents and coating additives. Most applications require refined vegetable oil that is essentially colorless to light yellow and free from insoluble material.

The production of refined oil is only done at commercial level which requires too much labour, energy and skills to operate the system which cannot be achieved by the local people in our societies.

Since there is high production of vegetable oil crops and also high demand for purified vegetable oil on the market, this project is aimed at the development of an efficient vegetable oil purification system which is cost effective and can be operated locally using available biomass energy and can bridge the gap between the increasing demand and low production rate yet the potential of high production is available.

The choice for the design of the system was dependent on a number of factors that were considered and these included social considerations such as political and legal issues, reliability and availability of labour, level of technical support and available technology, available local materials and energy sources, and two, operating condition considerations and these included degumming temperature and pressures, steam temperatures and pressure, oil density and processing required operational times, and third, economic considerations such as the minimization of net costs, cash flows, employment of resources, future operation and maintenance

To achieve this, data was gathered through Extensive discussions and consultations with colleagues and resourceful individuals in the field were used during the design. Also technical consultations and discussions with my supervisors were key inputs in this project together with technical support from the vegetable oil processing industries in Uganda.

A cheap physical oil purification system was designed, constructed and then tested for performance.

DECLARATION

I HASAKYA MUSA hereby declare to the best of my knowledge that this is my true and original piece of work and has never been submitted to any university or higher institution of learning by anybody for any academic award.

Signature .....

Date ....19th June 2014.....

APPROVAL

This piece of work has been submitted to the faculty of Engineering after approval from my supervisors

MAIN SUPERVISOR

Mr. Sserumaga Paul

Signature 24/06/2014

Date .....

CO-SUPERVISOR

Mr. Mugisha Moses

Signature .....

Date .....

DEDICATION

I dedicate this report to my parents who have supported me throughout my life and academic struggle up to this point.

ACKNOWLEDGEMENT

Firstly, I would like to acknowledge my project supervisors Mr. Sserumaga Paul and Mr. Mugisha Moses for their guidance and support in the course of this project.

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In a special way, I acknowledge Mr. Kasumba Andrew for his advice, guidance and encouragement during the preparation of this report

May the Almighty God reward you abundantly

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CHAPTER ONE

1.0 INTRODUCTION

This chapter gives the significant agricultural problem this project is solving, a brief introduction about vegetable oil crops and oil production and gives the objectives of the research, its relevance and scope of the study.

1.1 Background of the study

According to Gunstone (2002) vegetable oils are obtained from seeds or fruits of vegetable crops by pressing or solvent extraction. Oil can be derived from such seeds as Corn, Soybean, Cotton, Canola, Peanut, Sunflower and many others (Rosillo-Calle et al, 2009).

From the vegetable oil development project report (2011), major oil crops grown in Uganda include; sunflower, simsim, groundnuts, soybean, palm tree and cotton. These oil crops are majorly grown in the areas of Lira, Apac, Soroti, Katakwi, Kumi, Pallisa, kaberamaido, Mbale, Sironko, Kapchorwa, Masindi, Gulu, Pader, Kitgum, Amolatar, Amuria, Bukwo, Manafwa, Amurur, Budaka, Bukedea, Dokolo and Oyam (MAAIF, 2011).

Vegetable oils find a wide variety of uses in consumer products including use as food additives, lubricants, solvents and coating additives. Most applications require refined vegetable oil that is essentially colorless to light yellow and free from insoluble material.

Crude (freshly extracted) oil contains moisture, and fibre, resins, colours etc. from the plant material, which make it darker and more opaque. Locally these materials are removed by clarification – either by letting the oil stand undisturbed for a few days and then separating the upper layer, or by using a clarifier. This consists of an oil drum placed above a fire. The oil is boiled to drive off water and destroy naturally occurring enzymes and contaminating bacteria. The oil is allowed to stand and contaminants the separate out.

The oil is filtered through a cloth and heated briefly to 100°C to boil off any remaining traces of moisture. This is usually sufficient to meet the quality needs of customers and give a shelf life of several months when correctly packaged. However, the oil requires additional purifying stages of de-gumming, neutralising and de-colouring to have a similar quality to

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