BUSITEMA UNIVERSITY

Pursuing Excellence

FACULTY OF ENGINEERING

DEPARTMENT OF AGRICULTURE MECHANIZATION AND IRRIGATION ENGINEERING

DESIGN AND CONSTRUCTION OF A TWO POT WOOD GASIFIER STOVE

BY

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DESIGN PROJECT SUBMITTED IN PARTIAL FULFILMENT FOR THE AWARD OF BACHELOR'S DEGREE IN AGRICULTURAL MECHANISATION AND IRRIGATION ENGINEERING, BUSITEMA UNIVERSITY

MAY 2015

ABSTRACT

A large part of the world's population about 2.7 billion people rely on traditional biomass for cooking with 657 million of these in sub-Saharan Africa (OECD/IEA, 2010). Like any other developing country, Uganda is confronted with an energy situation of inadequate and unreliable energy supplies. More than 90% of Uganda's energy requirements are met by biomass (MEMD, 2007). Which is often burned in open fires (three-stone) or poorly functioning stoves (Reddy et al., 2000), such stoves exhibit high fuel consumption, incomplete combustion thus release of smoke, particulate matter and other constituents that cause damage to human health. Therefore, this project was undertaken to design and construct a two pot wood gasfier stove which greatly reduce fuel consumption, provides a clean cooking environment and then gives charcoal as a by-product.

The designed and fabricated stove was tested and results indicated high heat transfer from the reactor to saucepan by giving 54.1% thermal efficiency, fuel saving potential portrayed by specific fuel consumption of 75.8g/liter, reduced cooking time by achieving 12minutes and 19 minutes boiling of 3liters and 1liter in the first and second pot respectively.

The designed and fabricated stove is simple and easy to use, it is batch fed which gives an operator more time to attend to other activities during cooking process.

DEDICATION

This report is dedicated to my parents Mr. Edward Higiro and Mrs. Advera Higiro, for their sacrifice and love they have rendered to me through this academic journey. May the Almighty God bless you abundantly.

ACKNOWLEDGEMENT

First and foremost, I am grateful to the Almighty God for His divine intervention all through my lifetime and this education level. Without you God, I could do nothing.

I am exceedingly indebted to my supervisors Mr. Okiring Patrick and Mr. Mugisha Moses for their technical advice and invaluable contributions towards this report.

In the same vein, I am extremely appreciative to my course mates, roomies and all my colleagues especially Malinga Tadeo Jude and Aligawesa Godfrey for their good cooperation during my stay at Busitema University.

Last but not least, I extend my sincere gratitude to the rock of my family and great friends, my wife Lilian Tumuramye and my children Precious and Evans, I love you all more than words can tell, for your immeasurable contributions, love, care, comfort and consolations.

May God bless you all.

DECLARATION

I *TUMURAMYE PHILESIAN* hereby declare that this report is my original work, except where stated and there is no copy of this work that has been presented for any award in any University or institution of higher learning.

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TUMURAMYE PHILESIAN

BU/UG/2011/228 Date. 22/.05./.2015

APPROVAL

This report has been approved by:-

Signature: ..... Date: .....

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CHAPTER ONE

1.0 INTRODUCTION

1.1 Background

A large part of the world's population about 2.7 billion people rely on traditional biomass for cooking with 657 million of these in sub-Saharan Africa (OECD/IEA, 2010). A large proportion of these users (85%) are in rural areas where financial and structural challenges have made access to modern energy alternatives difficult. Nearly in all developing-countries' households, wood, charcoal and other solid fuels (mainly agricultural residues and coal) are often burned in open fires or poorly functioning stoves. (Reddy *et al.*, 2000)

Like any other developing country, Uganda is confronted with an energy situation of inadequate and unreliable energy supplies. More than 90% of Uganda's energy requirements are met by biomass (MEMD, 2007). With more than 85% of Uganda's population lives in rural areas, almost all of them depend on biomass (wood and crop residues) for cooking and heating often using inefficient technologies. Even in urban areas, a vast majority of the population use charcoal for cooking. Electricity is available only to 9% of the total population and 3% in the rural areas (UES, 2013)

Firewood is used mainly with three-stone stoves in rural households for cooking and for food preparation by commercial vendors in urban areas. Less than 9% of all households use efficient wood stoves. This is much associated with incomplete combustion in these inefficient stoves which leads to the release of smoke, particulate matter and other constituents that cause damage to human health (mostly women and children) in the cooking environment. The conversion of firewood to charcoal uses mainly earth mounds and pits, which give an average conversion efficiency of about 10% - 15% (MEMD, 2007).

With introduction of gasification (micro) in household application, energy challenges associated with cooking can be minimized. Therefore, this project was undertaken to design and construct a two pot wood gasfier stove which greatly reduce fuel consumption, clean cooking environment and then gives charcoal as a by-product.

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