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BUSITEMA UNIVERSITY

FACULTY OF ENGINEERING

DEPARTMENT OF TEXTILE AND GINNING ENGINEERING

FINAL YEAR PROJECT

DESIGN AND CONSTRUCTION OF A MANUAL WASHING MACHINE

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ABSTRACT

This project comprise of five chapters; Chapter one presents background of washing and its defination. The problem considered in this study is presented in the problem statement and the justification, objectives and scope of the study are also presented.

Chapter two discusses the details of the various aspects involved in laundry washing ; different washing techniques and the operation of the existing washing machines are presented

In relation to the objectives of this study, the methods and procedures that will be followed in order to come up with the design of the manual washing machine, fabricate, test the performance and evaluation of the prototype were also handled in chapter three.

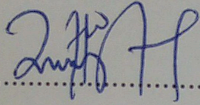
Chapter four includes the results and discussion basing on the test that was carried out in chapter three.

Chapter five enlists the recommendations and conclusions derived from the design of the manual washing machine. Appendices are attached at the end of this document.

DECLARATION

I *OGWOK SOLOMON* declare that the work in this report was carried out in accordance with the Regulations of Busitema University. The work is original except where indicated by special reference in the text and no part of this work has been submitted to any other university for examination and degree award. Any views expressed in this report are those of the author and in no way represent those of Busitema University.

SIGNED:



DATE:

20/07/2015

APPROVAL

This report has been submitted to the department of Textile Engineering of Busitema University for examination with the approval of the supervisors below.

Mr. Ssembatya Martin

(Main Supervisor)

Sign:

Date.....

DEDICATION

This report is dedicated to my father the late RAPHAEL OKELLO for all he ever did for me during his life.

ACKNOWLEDGEMENTS

I acknowledge firstly God the Almighty, for His providence and protection during the course of the study in Busitema University.

With great honor, I return thanks to the management of Busitema University, faculty of engineering for considering final year projects as one core activity for strengthening engineering skills in her students. Thanks to the head of department of textile Engineering, Dr.Nibikora Ildephonse and all the lecturers, without their lectures and general guidance, inter-relating theory with practical would be impossible

With heartfelt gratitude, I appreciate the personal contributions of Mr. Ssembatya Martin for his guidance during the course of writing this report.

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CHAPTER 1: INTRODUCTION

Background

Laundry washing, in the sense of cleaning textiles in aqueous liquor, is a complex process involving the cooperative interaction of numerous physical and chemical influences. In the broadest sense, washing can be defined as both removal by water or by an aqueous detergent solution of poorly soluble residues, as well as the dissolution of water-soluble impurities. (JAKOBI and LÖHR, 1987, SMULDERS et al., 2007)

TERPSTRA defines the primary objective of cleaning as "...restoration of the fitness for use and the esthetical properties of the textiles, e.g. removal of soil, stains, odors and creases and regaining surface smoothness and thermal isolation." (TERPSTRA, 2001, p.4)

LEMARE defines other benefits from laundering processes, such as the maintenance of the appropriate hygiene (LEMARE, 1987)

The middle of the 19th century witnessed the appearance of the first mechanical washing machines. Typically a closed tub with wooden paddles (agitators later made of metal) allowed laundresses to work in an upright position and not get their hands wet so much. Laundry was no longer the laborious and time-consuming ritual it had been in the past. (De Bonneville, 2003)

The first electric washing machine was produced in the U.S. in 1908. It featured a top-mounted electric motor-driven agitator. Towards 1920, new machines were fitted with a horizontal cylinder. But this did not prevent manual machines from prospering. At the end of the 1940s, electric machines were fitted with an impeller. During the 1950s, a heating element and automatic spin cycle were added (some machines had separate spinners, alongside the wash drum). (De Bonneville, 2003)

The 1960s saw the advent of automatic machines which, at the touch of a button, wash, rinse and spin in the same drum, at first mounted vertically, and later horizontally ("front loaders"). By the end of the 20th century, washing machine technology had continued to evolve. Electro-mechanical controls (knobs) had been replaced by electronic ones (push-buttons). The newer machines required less water and newer laundry products worked better at lower temperatures, rendering the laundry process more energy-efficient. (De Bonneville, 2003)

However in the developing world powered washing machines exist, but they are impractical in rural regions because running water and electricity are expensive or unavailable thus washing laundry still remains a difficult, time-consuming task that falls solely on women. Mothers and daughters typically spend 8 hours each week scrubbing each piece of their family's clothing and wringing out the harsh washing solution by hand. (Radu Raduta 2005, *et al*)

Problem statement

In developing countries, rural women are among the least privileged. Women are both essential to the family unit and integral to the economy, yet they rarely have equal opportunities for education, career development, or social status when compared to men.

One factor behind the inequality is the long list of responsibilities that traditionally fall to women. Not only do women perform agricultural duties and care for livestock alongside men, but women are also responsible for many domestic chores. Usually, new technology improves people's efficiency, but women benefit less from new technology for several reasons. First, women's duties are neglected by technological improvement efforts because domestic chores are often seen as cultural obligations for women so little effort is expended to diminish them. Second, foreign aid in the form of appropriate technologies is unevenly distributed because women are often considered less technically competent than men. Factors like these tend to prevent the development of improved technology for women's uncompensated, time-consuming, and laborious tasks.

There is large technology gap between traditional hand washing and electric washing machines. In communities around the world, many cannot afford to buy electric washing machines, which cost at least five hundred thousand Ugandan shillings. Even if people had the initial purchasing power, many times they cannot afford the electricity required to operate these machines. Thus, it is very common for women to wash clothes by hand. Washing clothes by hand costs very little monetarily, but is an extremely time consuming process. Moreover, repeated washing is harmful to hands due to prolonged exposure to harsh chemical surfactants combined with deliberate agitation.

Cold weather makes hand washing especially painful. The chemicals and agitation causes dryness and cracking of the skin that makes it difficult for women to do other daily activities. If clean water is not easily available, women often wash laundry in contaminated waters, which can cause infections through the broken skin. Additionally, the posture required for

hand washing clothes can cause back pains, also hindering their daily activities. In Uganda, and most likely in many other countries, some women earn their livelihood by washing clothes by hand for wealthier households. For these women and mothers with new born babies, the effects of harsh chemicals and agitation are magnified because they wash clothes very frequently. Moreover, the fact that hand washing is time-consuming means that their productivity and income are narrowly limited.

Justification

A manual washing machine would allow women to wash clothes faster and with less strain. Young daughters who help their mothers with domestic chores may also have the opportunity to concentrate more on their studies. Laundromat micro-enterprises may even arise. Conditions vary in developing countries, but women in many regions are washing clothes manually while they could be doing more profitable or rewarding work elsewhere.

There are existing solutions to the clothes washing problem, but no existing technology is both practical and affordable for people in this target community. Existing solutions are either designed for industrialized nations with running water and electricity, or they are not practical for rural setting where replacement parts are difficult to find.

Commercial washing machines have existed for many years, but they are expensive and require electricity to operate. Sometimes, they are available in urban settings, but the average family cannot afford to purchase one. In rural areas, commercial washing machines are not an option because electricity may be unavailable or extremely expensive.

Objectives of the Study

Main objective

To design and construct a low cost manual washing machine.

Specific objectives

- To design the components of the washing machine.
- To fabricate the prototype of the designed washing machine.

Scope of the study

This study was limited to the design and construction of a manual washing machine for the Ugandan rural women.

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