BUSITEMA UNIVERSITY
Pursuing Excellence

FACULTY OF ENGINEERING

DEPARTMENT OF WATER RESOURCES AND MINING ENGINEERING

FINAL YEAR PROJECT

INVESTIGATING THE EFFICIENCY OF A BIOSAND FILTER

CASE STUDY: River Okame

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ABSTRACT

Over 1 billion people in the world lack access to safe water. Nearly all of these people live in developing countries, especially in rapidly expanding urban fringes, poor rural areas, and indigenous communities which includes our very own Uganda. Municipal water treatment systems are frequently impractical and often unaffordable in these settings. At the present time, household water treatment systems provide the only reasonable alternative for many.

Due to the increase in the number of deaths reported every year as a result of drinking contaminated water, Point Of Use (POU) water treatment systems are encouraged in rural areas of Developing Countries. One of the most promising is a Biosand filter. However, despite this successful implementation, there has been almost no systematic, process engineering research to substantiate the effectiveness of the BSF in its design and operation. This study is proposed for five months targeting a population segment of Busia district, Busire village who depend on river Okame.

The major objectives of this research were to: (1) Investigate the rural raw water quality parameters of river Okame (2) To determine the effects of hydraulic retention time on removal of turbidity and microbiological contaminants and (3) determine the percentage removal of microbiological contaminants and turbidity using a Biosand filter. Feed water was charged to the filter for 6 weeks. The performance of the filter in reducing microbial concentrations was highly dependent upon filter ripening over weeks of operation. Reductions of E. coli ranged from 96% to 99%, with geometric mean reductions after at least 30 days of operation of 98.5%. Turbidity reductions ranged from79% to 85%. E. coli effluent data indicates that E.coli reduction by BSF may differ substantially depending upon the specific pathogens. It is recommended that this should be looked into quantitatively. During the raining seasons, the raw water was highly turbid thus the author recommends sedimentation or design an extra feature in the unit that caters for turbidity.

DECLARATION

I **APACHO RITAH CHLOE** hereby declare that, this report is a true work of my hands and has never been presented by any person or institution for an academic award.

Signature: .....

Date: 27/05/2016.....

ACKNOWLEDGEMENT

I extend my sincere gratitude and appreciation to the Almighty God, the giver of all knowledge, wisdom and wealth; who guided, provided for and enabled me to complete this proposal.

I am very grateful to Busitema University for the great opportunity offered me to pursue my degree course and in conclusion undertake this research under their guidance.

Sincere appreciations go to my supervisors Eng. Okello Geatano (main supervisor) and Miss Nakabuye Hope Njuki (co-supervisor) who provided valuable technical guidance, patience, diligence, support and absolute commitment during the span of this period and for spending hours of their valuable time in order to give me due attention.

Am indebted to my parents, benefactors and friends who have supported me financially, spiritually and socially. God bless you all!

DEDICATION

I dedicate this report to my mother, Miss Arecho Tabitha who has been my pillar that I may come this far and see this as a success. May God continue to bless your endeavors.

APPROVAL

This project proposal has been submitted to the faculty of Engineering for examination with approval of my supervisors mentioned below;

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Main supervisor

Signature.....

Date: ...../...../.....

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Co-supervisor

Signature.....

Date: ...../...../.....

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ACRONYMS

WHO	World Health Organization
AMREF	African Medical & Research Foundation
POU	Point of Use
SODIS	SOlar DISinfection
SSF	Slow Sand Filter
BSF	BioSand Filter
CAWST	Centre for Affordable Water and Sanitation Technology
UNC	University of North Carolina
UV	Ultra Violet
PET	PolyEthelyene Transparent
NARI	Nimbkar Agricultural Research Institute
NTU	Nephelometric turbidity units
THM	TriHaloMethane
NWSC	National Water and Sewerage Corporation
UC	Uniformity Coefficient
ES	Effective Size
CFU	Colony Forming Units
E. coli	Escherichia coli
HWTS	Household Water Treatment and safe Storage
MDGs	Millennium Development Goals
NGO	Non-Governmental Organization

1 INTRODUCTION

This chapter outlines the relevant information about the project, problem statement, and justification, objectives of the study, purpose of the study and the scope of the study.

1.1 Background

The need for water in developing countries is a growing concern as water demands quickly exceed the capacity of developing countries to develop water resources. In 2010, it was estimated that nearly 1 billion people on earth lacked access to improved water sources (WHO, 2011). In addition as the world marked water day on Saturday 9 April, 2016 research showed that over 10 million Ugandans lacked access to safe water (Ojeru, 2016).

In the Millennium Development Goals (MDGs), the United Nations expressed its commitment by 2015 to Half the proportion of people without sustainable access to safe drinking water and basic sanitation ((UNDP), 2009). For water supply, the United Nations had reported good progress towards meeting the MDGs (WHO, 2004). According to Ministry of Water and Environment Annual Sector Performance Report, 2015 Uganda rural safe water coverage is at 64%.

Though there has been good progress, it has also been recognized that there are serious gaps between the results in rural and urban areas. Among the population without access to an improved source of drinking water, 84 % live in rural (UNICEF, 2008). Lack of safe drinking water in rural areas is more profound since water distribution systems cannot be easily and cost-effectively extended. Therefore, greater effort is required to provide water to the poor and those living in the rural areas. One of the rural areas include Busire village, Busire Parish, Busitema sub County in Busia District my case study area. From Preliminary studies, Busire village has a staggering 60% of the population depending on River Okame and from the health report of Health center III acquired from the district health office Busia, prevalence of water borne and water related diseases are deemed present.

In the past decade, Household Water Treatment and safe Storage (HWTS) has been gaining in recognition as an effective way to provide clean water to the developing countries, especially in

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