BUSITEMA UNIVERSITY
Pursuing Excellence

FACULTY OF ENGINEERING

DEPARTMENT OF MINING AND WATER RESOURCES ENGINEERING

BACHELOR OF SCIENCE IN WATER RESOURCES ENGINEERING

A FINAL YEAR PROJECT REPORT

DEVELOPMENT OF A SURFACE WATER TREATMENT PLANT DESIGN TOOL

BY

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EXECUTIVE SUMMARY

Water is considered a prime substance on earth for survival of all organisms. Safe and clean water originates through certain treatment processes, process units and plants. Water treatment plants are one of the crucial facilities in the world today since it involves production of water that is essentially safe and basic to the general public. They are designed and owned by water utility operators particularly NWSC in Uganda who are vested with task of extracting water from its source (rivers and lakes, etc.), treating it and supplying it to the users.

Most existing water treatment plants in some parts of Uganda produce water for the public that do not match with the National's water quality requirement following the low technological advancement in the company and the country at large. Their design is being done manually thus making the system inefficient since it involves human errors, bulky work, time consuming and much costs involved through labor.

A computerized water treatment plant design tool that encompasses automation in the design of new water treatment plants will eradicate this problem. This application is simple through inter input data needed for each process that provided , the program provide feature that enable the user to change the input data needed for each unit from lists contained different type of these parameters. The user can design and save results for the different water treatment process units under consideration viz. plain sedimentation basin, coagulation basin, flocculation basin, sedimentation basin and rapid sand filter basin regardless of the sequence of operation.

This design tool eradicates time wastage, human errors and bulky work that calls for higher costs. This automated design tool will lead to the development of new efficient treatment plants that will ensure production of water for consumption by the public that is palatable at relatively low costs.

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I thank my lecturers and friends for the time and guidance they have offered towards this project.

DECLARATION

I Nabimanya Edwin, hereby declare, to the best of my knowledge, that this final year project report is an outcome of my original work and that it has never been presented to any institution of learning for an academic award.

Signature

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Date

2nd June 2018

NABIMANYA EDWIN – BU.UG.2014.108

APPROVAL

This is to certify that the project has been carried out under my supervision and this report is ready for submission to the Board of examiners and senate of Busitema University with my approval.

1. **MAIN SUPERVISOR:** MR. MASERUKA S. BENDICTO

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List of acronyms

NWSC- National water and Sewerage Corporation

Etc. - et cetera

Dia - diameter

MATLAB- Matrix laboratory

WTP- Water treatment plant

SWTP- Surface water treatment plant

GUI- graphical use interface

Viz. - Namely

Pdf- portable document format

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CHAPTER ONE: INTRODUCTION

1.0 Background of the study

Water is the most important substance on earth for survival of all organisms (Chavan *et al.*, 2015). Water is considered to be one of the physical environments of human beings and has direct impact on their health. Effective utilization of the existing water resources is the need of the hours and of all times. The water available is to be treated as a solution to the issue. In total of 100% water available on earth, only 0.01% of the total water of the earth is available for consumption (Hagemann *et al.*, 2013). With the present population growth-rate and high water demand, there is a need to efficiently manage the available water resources which is the most problem in the world.

The availability of a reliable and clean supply of water is one of the most important determinants of our health. Historically, improvements in human health have been related to improvements in our water supply system from source to tap, therefore surface water treatment plants are important in modern society. Many diseases that can be contracted by humans can be waterborne such as typhoid, cholera, amoebiasis (amoebic dysentery), giardiasis, polio, paratyphoid, salmonella, etc. bacteria, protozoans, viruses, helminthes all can be and are waterborne and can cause illness in humans. Water is not a primary mode of transmission of any disease but when water carries an agent capable of causing an infection it is a medium that can carry an infection over a wider area to a more diverse population in a short period of time than almost any other mode of transmission expect perhaps air (Engelhardt, 2012) Surface water is mostly contaminated and not suitable for direct usage, consequently it is subjected to direct pollution from natural and human activities(Ishii *et al.*, 2013).

Clean and safe water is an engineering grand challenge (Wang *et al.*, 2014), thus there is a need to optimize the existing water plants as well as come up with better and improved plants which will produce water complying with quality constrains (Chamier *et al.*, 2012). Safe water basically originates through certain water treatment processes(Qu, Alvarez and Li, 2013). Water treatment is the process of removing pollutants from raw water to produce safe and clean water that matches with the required standards (Vigneswaran *et al.*, 2013). Different water treatment types consist of different treatment processes and units basing on the quality of raw water to be treated and the

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