FACULTY OF ENGINEERING

DEPARTMENT OF MINING & WATER RESOURCES ENGINEERING

FINAL YEAR PROJECT REPORT

DEVELOPMENT OF A WASTEWATER TREATMENT PLANT DESIGN TOOL

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Abstract

There are two fundamental reasons for treatment of wastewater that is, prevention of pollution and thereby protecting the environment, and protecting the public health by safe guarding water supplies and preventing the spread of water borne diseases. Proper design, construction together with good operation and maintenance are essential for waste water treatment plants (WWTP), in order to produce effluents which are satisfying the safe disposal standards prescribed by the regulatory authorities. Carrying out a design on WWTP under several conditions and various criteria is becoming complex, tedious and cumbersome. The era of Computer has resulted in a faster, accurate, and more advanced method of obtaining data, storage, processing and analysis. Several tools are being developed to design and solve various engineering problems and water resources engineering field is no exception. Some packages have been developed in this area in basic, C-language, visual basic etc. In this work a computer program in visual basic has been developed for comprehensive design of wastewater treatment plant which incorporates activated sludge process as biological treatment method. All the units of WWTP are included in the design and the program is developed in a very user friendly manner by referring various standard procedures and manuals. Design for the checks was also developed in tooltips. Some of the checks include: Aeration Period, Sludge Retention Time, Volumetric Loading and Return Sludge ratio. Visual Basic Package was adopted for the design. The validity of the software has been verified by test running and comparison with an existing plant data. This program not only helps in sizing the treatment units but also helps in understanding the plant's capacity.

Declaration

I **Wanyama Robert Archie**, declare that all the material portrayed in this project report is original and has never been submitted in for award of any Degree, certificate, or diploma to any university or institution.

Signature **Date**

…….. ……

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.

MAIN SUPERVISOR:

NAME: Kimera David

SIGNATURE: 

DATE: 07th June 2018

CO-SUPERVISOR:

SIGNATURE: ……

DATE: ……

Dedication

This report is dedicated to my beloved Mother Ms. Georginah Macho in appreciation for her selfless care and whole-hearted support provided to me since childhood, and for the spirit of hard work, perseverance, courage and determination groomed into me, which attributes I have cherished with firmness and which have indeed made me what I am today.

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Finally I give credit to my fellow finalists who have always told me inspiring words of counsel and wisdom. May the Good Lord bless and reward them with success.

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1 CHAPTER ONE: INTRODUCTION

1.1 Background of the study

The increasing pace of industrialization, urbanization and population growth that our planet has faced over the last one hundred years has considerably increased environmental pollution and habitat destruction, and negatively affected water, air and soil qualities. In this the context within which wastewater treatment has become one of the most important environmental issues of the day, to such a degree, it reduces or prevents pollution of natural water resources, promotes sustainable water re-use, protects the aquatic environment and improves the status of aquatic ecosystems(Kumar, 2011). Urban wastewater treatment has promoted the construction of new facilities to effectively manage wastewater deposits from households and industrial activities.

In Uganda, Bugolobi waste water treatment plant (WWTP), was designed to handle a hydraulic flow capacity of 33000m^3/day with a dry weather flow of 16000m^3/day, from the existing 135km of the sewerage line network which covers approximately 8% of Kampala households. Following the increase in population, more than 8% of the Kampala households deposit to Bugolobi WWTP sewer lines. Currently a new WWTP is being constructed and the 40 billion shillings project which is will treat 46 million litres of waste per day including the Nakivubo Channel and produce 630kv of electricity.

Design of these waste water treatment facilities plays a very important part in their construction. And if not done efficiently could result in various health, social and economic hindrances to the government and the community at large(Flajsig, 1999). Clearly, during planning and design of the first plant in Bugolobi, the rate of population increase was either underestimated or not considered. Population projections are estimates of the population for future dates. They are typically based on an estimated population consistent with the most recent decennial census and are produced using the cohort-component method(Kaneda and Bremner, 2014). This is one the key aspects when designing wastewater treatment plants.

The design method used, besides being lengthy, it is a costly one which involves more than one skilled personnel, each getting paid highly to do their job. All these cost implications could be prevented if a more time saving and less costly mean is devised to efficiently design wastewater treatment plant units.

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