BUSITEMA UNIVERSITY
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FACULTY OF ENGINEERING

DEPARTMENT OF WATER RESOURCES AND MINING ENGINEERING

WATER RESOURCES ENGINEERING PROGRAMME

FINAL YEAR PROJECT

DESIGN AND SIMULATION OF AN AUTOMATIC WASHOUT SLUICE GATE SYSTEM FOR BUDUDA-NABWEYA GRAVITY FLOW SCHEME WATER INTAKE

BY

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ABSTRACT

Washout sluice gate is a point at which water exists to a space enclosed by walls. Its is widely being used for controlling discharge and flow depth in irrigation channels, large sewers, and in hydraulic structures like water intakes. Due to delays in manual opening and closing of the gate, sediment is left to raise to the height of the weir where its washed to the intake pipes that are used for distributing water from the intake to the treatment plant. This leads to too much sediment loading which is a point source pollutant in the treatment plant, high rate of corrosion and bursting of the pipes as the intake where the gate is located is on one of the hills of mountain Elgon national park a gazette and highly place, the person responsible for operating it is expected to walk on foot for 2.5kmwork

An automated washout sluice gate (WSG) system was designed using Solidworks software and its simulation was carried out using Arduino software

It all starts after sediment accumulating in the sedimentation chamber to 0.29m thickness, the ultrasonic sensor senses it when the distance between it and sediment is zero and it sends an impluse to the micro-controller to start the servo motor through its shaft and bevel gears to rotate at 50 rpm in an anti-clockwise direction for 47 seconds hence opening the gate to height of 0.67m. The motor stops to rotate for 1 second to allow sediment to be washedout the it again starts to rotate for 47 seconds to close the gate in a clockwise direction. Bevel gears are used to reduce and transfer the horizontal motion to vertical of the motor. Messages are sent to three different people using GSM when the WSG is being opened and when closed, this is to enable monitoring of the performance of the system at a distance. Solar power is the source of power to be used for the system

DECLARATION

I **KALAJJA BAZIRIO**, declare that the information in 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: 24th/05../2017

APPROVAL

I **KALAJJA BAZIRIO,** submit this final year project report to the Faculty of Engineering for examination with approval of my;

MAIN SUPERVISOR: MR.OKETCHO YORONIMO

Signature..... Date...../...../.....

CO-SUPERVISOR: MR.BAGAALA BRIAN

Signature..... Date...../...../.....

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May the Almighty God bless them abundantly

DEDICATION

This piece of work is dedicated to Mr. Kagaire Debi family

LIST OF ABBREVIATIONS

DWD - Directorate of Water Development

UNEP - United Nations Environment Programme

BSN - British Standards

GSM - Global System for Mobile communication

Mt. - Mountain

NP - National Park

UWA - Uganda Wild life Authority

WSG - Washout Sluice Gate

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1 CHAPTER ONE: INTRODUCTION

This chapter entails relevant information about the project, problem statement for the intended design while showing how automation of the sluice washout gate will reduce the existing problems through fulfillment of the stated objectives of the study and the scope of the study.

1.1 Background of the study

A washout sluice gate (WSG) is a point at which water exists to a space enclosed by walls. WSG may prevent or control entry and exit, or they may be merely decorative. They are widely being used for controlling discharge and flow depth in irrigation channels, large sewers, and in hydraulic structures like water intakes.

The Environmental Protection Agency lists sediment as the most common pollutant in rivers, streams, lakes and reservoirs (Chapman, 1996).
While natural erosion produces nearly 30 percent of the total sediment in Uganda, accelerated erosion from human use of land accounts for the remaining 70 percent.
Sediment pollution causes $16 billion in environmental damage annually.

In 2015, a Bududa-Nabweya gravity flow scheme water intake was constructed on one of the hills of Mt. Elgon within the Mt. Elgon NP by KOL and CEMIC Companies where water of high pressure is directed to the water intake pipes that direct it to the treatment plant. On this intake, a WSG was also constructed in the sides which is opened manually for sediment to be washed away that will have accumulated within the intake sediment chambers
Rate of sediment accumulation within the intake chambers varies with a given season as opening of the gate is done after a period of one week in a rainy season and two weeks in a dry season
Amidst the challenges faced in operating of the WSG such as the hilly long distance of 2.5km to be travelled on foot by the persons responsible, the water intake being located in a gazetted place by UWA and possible attacks from wild animals, delays in opening have been observed which has led to sediment accumulation in the water intake to the level of the weir. This sediment is later washed by the flowing waters to the intake pipes that has led to pipe blockages, leakages, too much sediment loading in the treatment plant

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