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DEPARTMENT OF MINING AND WATER RESOURCES ENGINEERING

WATER RESOURCES ENGINEERING PROGRAMME.

**DESIGN AND SIMULATION OF DESALINATION SYSTEM FOR BRACKISH
WATER**

BY

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ABSTRACT.

This paper begins with an overview of the origin, magnitude, geographical distribution and health consequences of saline water around the world and particularly in Aputi Sub County.

Electrodialysis is an electrochemical separation/ desalination process in which ions are transferred through ion exchange membranes by means of a direct current (DC) voltage. The process uses a driving force to transfer ionic species from the source water through cathode (positively charged ions) and anode (negatively charged ions) to a concentrate stream, creating a more dilute stream. ED selectively removes dissolved solids, based on their electrical charge, by transferring the brackish water ions through a semi permeable ion exchange membrane charged with an electrical potential.

Based on a simple random sampling technique the average TDS level was **2462mg/l** in Aputi sub county, Akuriluba parish had the highest level of TDS of **6985.3mg/l**, which is above the potable standard of drinking water which is **1500mg/l**, than other parishes of Opal, Adonyoimo, Otira, Anywali, and Amai in Aputi Sub County. Under operating conditions of current $I=10A$, current efficiency η 8.08×10^{-8} and other parameters, design and simulation showed a SRP of 96%, and the system was economically viable with a return period of 2 years.

Key words | Desalination, Electrodialysis, simulation, MATLAB 2013.

DECLARATION

I ARAO FELISTER 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: ...30/5/2017:



APPROVAL

This piece of work has been approved by;

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Signature.....

Date.....

DEDICATION.

This piece of work is dedicated to all those who supported, guided and financed me throughout this level of education especially my parents, my siblings, my supervisors and my friends.

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I am very grateful to the Almighty God for the protection, guidance and good health He has provided to me.

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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.

LIST OF ACRONYMS/ABBREVIATION.

EDR	Electro dialysis Reversal.
WHO	World Health Organization.
RO	Reversed Osmosis.
MSF	Multistage Flash Stage.
MED	Multi Effect Distillation
HDH	Humidification Dehumidification.
VC	Vapor Compression.
SRP	salt removal percentage.
pH	potential Hydrogen.
C_{in}	concentration in.
C_{out}	concentration out.
η	current efficiency.
F	Faraday's constant.

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CHAPTER ONE

1.0 INTRODUCTION.

1.1 Background of study.

Groundwater is the most important source of potable water in Uganda, especially in the rural areas, and provides 80% or more of the water supply (Taylor, 2000). Water is abstracted from both the fractured bedrocks and from the overlying weathered regolith. The regolith aquifer is seen increasingly as a usable resource which aid agencies are seeking to develop on grounds of favorable yields and lower cost than the deeper ground waters from the basement (Taylor and Howard, 2010).

Meanwhile, demands for fresh water are tightening across the globe. Reservoirs are drying up; aquifers are falling; rivers are drying; and glaciers and ice caps are retracting. Rising populations increase demand, as do shifts in farming and increased industrialization. Climate change poses even more threats in many regions. Consequently, the number of people facing water shortages is increasing (World Water Day, 2007).

Amolatar district in Northern Uganda has the main water supply technology which is the deep borehole. It has boreholes of which most of them are non-functional and are considered abandoned due to water salinity and technical problem. Another source of water is Lake Kyoga and Lake Kwana which are highly polluted through non-point sources. Other low cost technologies like shallow wells, spring well gravity flow scheme cannot be implemented due to hydro geological conditions. (DWO, 2015).

Salt is a common substance that can leach into ground water and drinking supplies from a variety of places such as erosion of road salts to streams, natural salinity of some aquifers, Sodium bearing rock minerals. Continuous and excessive consumption of saline water exposes risks to human health such as high blood pressure, dehydration, High levels of salts may affect the taste of drinking water to humans. To help the people of Amolatar get fresh water, Desalination of brackish water is an important alternative.

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