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Department of Mining & Water Resources Engineering

FACULTY OF ENGINEERING

FINAL YEAR PROJECT REPORT

INVESTIGATING THE POTENTIAL OF ELECTROCOAGULATION AS PART OF TREATMENT PROCESS FOR REMOVING BLUE GREEN ALGAE FROM RAW WATER.

(**CASE STUDY AREA**: GABBA WATER TREATMENT PLANT)

BY

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Final year project proposal Report submitted in partial fulfillment of the requirements for the award of a Bachelor of Science in water resources Engineering Busitema University

1 ABSTRACT

Inner Murchison Bay which is a catchment area for Gabba water treatment plant is esthetically affected by algal bloom growth, and this is attributed to effluents from industries and residential homes upstream the catchment thus, implementing on total maximum nutrient load into the lake. High nutrient load in the raw water especially phosphates and nitrates are the key factors causing increased algal bloom growth. Presence of cyanobacteria/blue green algae in catchment has led to increased production costs in conventional water treatment plants, due to causing of increased chemical dosage needed for water treatment process. Addressing this call for a tremendous amount of research to be conducted to identify robust new methods of purifying water at lower costs.

The purpose of this research is to investigate the feasibility of electrocoagulation as part of water treatment process for removing blue green algae and other impurities such as total dissolved solids, and suspended solids out of raw water. This research is aimed at analyzing the efficiency of electrocoagulation in removing cyanobacteria out of raw water and also assessing the percentage reduction of chlorine dosages to be put into the effluent. The research also involved designing of electrocoagulation cell using aluminum plates as the electrodes, reacting in a bipolar manner. The electrocoagulation cell was designed for one-liter volume of raw water, requiring current density of 76.81A/m^2 and voltage of 12v direct current power supply. The experimental runs were 60minutes, 45 minutes and 30 minutes duration. A maximum of two experiments were run for each time duration to test for consistence in results, hence results of the unsettled samples were denoted as exp 1 and those of settled sample were denoted as exp 2. However, in 60 minutes duration experiments the residual aluminum concentration was higher than the national standards and those of 30 minutes duration were considered due to less dentation time, less residual aluminum and higher efficiency as compared to those of 45 minutes duration. Thus, considering effluent and raw water sample used in 30 minutes duration to carry out chlorine demand tests. In the laboratory analysis of chlorophyl a concentration, using 90% acetone method, the raw water had wet chlorophyl a concentration of 47.36µg/L and that in effluent was reduced by 93.75% at 30 minutes running duration of the cell, and from the chlorine demand curve, for effluent curve taking free chlorine = 0.67mg/L and a dose of 2.6mg/L and that of raw water taking approximate equal optimum dose from free chlorine of 0.68mg/L, is 5.5mg/L. On taking total volume discharge of pumps of Gabba 3 plant of 3,800,000L/hr
The raw water optimum dose of 5.5mg/L×3800000L/hr giving 20.9kg/hr and that of effluent the optimum dose of 2.6mg/L×3800000L/hr giving 9.8kg/hr. Hence the system efficiency is 53.1%, hence the remaining efficiency of 46.9% is to be achieved by chlorine.

The laboratory results revealed that; all the effluent sample tested positive expect for 60 minutes run experiment which had extremely high residual aluminum results. All the effluent physio-chemical parameters analyzed were slightly below the standards the recommended National standards for drinking water. Therefore, the feasibility study of electrocoagulation is a good base for future upgrades in the treatment processes of raw water treatment industries

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3 LIST OF ACRONYMS

NWSC	National Water and Sewerage Co-operation
Fe^{+2}	Iron (ii) ions
Al^{+3}	Aluminum ions
H_2O	Water
e^-	Electron
IMB	Inner Murchison Bay
UGX	Uganda shillings
EC	Electrocoagulation
HCl	Hydrochloric acid
Rw	Raw water
Eff	Efficiency
Al	Aluminum

4 DECLARATION

I **Kame Patrick Andrew** declare that the work presented here is out of my own research except where due references are made. It has not been partially or wholly submitted for any academic award to any institution of higher learning for any award whatsoever.

SIGN……

5 APPROVAL

This is to certify that this research proposal has been carried out under my supervision and that it is ready for submission to the department.

SUPERVISOR: MR. WANGI GODFREY

SIGN: ……..

Co SUPERVISOR: Mr. BAGOLE CHRISTOPHER

SIGN: ……

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