BUSITEMA UNIVERSITY
Pursuing Excellence

FACULTY OF ENGINEERING

DEPARTMENT OF MINING AND WATER RESOURCES ENGINEERING

INVESTIGATING THE POTENTIAL OF EGGSHELLS AS AN ADSORBENT IN THE TREATMENT OF TEXTILE WASTEWATER

(Case study: Fine Spinners Uganda Ltd (FSUL))

BY

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ABSTRACT

Treatment of wastewater is one of the biggest problems faced by textile Manufacturers. This is due to the fact that the effluent produced is much, high in Colour, BOD, COD, and Turbidity and yet faced with a problem of high costs incurred in treating the wastewater. The present study therefore examined the use of powdered eggshell in the removal of colour, turbidity, BOD and COD from textile waste water. So far, a number of efficient methods have been reviewed for the treatment of textile waste water such as chemical precipitation, ion exchange, reverse osmosis, ultrafiltration, Nano filtration, coagulation, flocculation, and so forth. Adsorption process being very simple, economical, effective and versatile has become the most preferred methods for removal of toxic contaminants from wastewater. The most commonly used adsorbent is activated carbon which is quite expensive and not readily available especially when it comes to treating a large amount of wastewater as per the case of textile industries. Batch adsorption experiments were used to study the removal of different pollutants from textile wastewater. The main parameters that influenced adsorption onto eggshell were contact time and eggshell dosage. The average initial concentrations of the effluent were found to be 1300ptco, 169 NTU, 1067mg/l and 528mg/l for colour, turbidity, COD& BOD respectively. The contact time ranged from 30 to 180 minutes while the adsorbent dosage ranged from 1 to 6g. For contact time, adsorption increased with increase in contact time and the maximum adsorption was obtained at a percentage of 60.5%, 60.1%,63.9% and 70% for turbidity,colour,COD and BOD respectively at 150minutes with 1g constant at the start. However, the other masses were also varied to establish the optimum contact time which was found to be 150mins. The research also gave similar results with adsorbent dosage, where adsorption increased with increasing adsorbent mass because of greater surface area provided with maximum value of 76.6%, 81.2%, 86% &86.1 for turbidity, colour, COD& BOD respectively at 5g (optimum dosage).

In conclusion, the rapid uptake and high adsorption capacity achieved, when the experiments were conducted at contact time, eggshell dosage, shows that eggshell is an attractive alternative adsorbent material for the removal of pollutants from textile wastewater, at a relatively cheaper cost than other conventional treatment methods.

DEDICATION

I dedicate this report to my parents; Mr. and Mrs. Florence Obol, guardians; Mr. and Mrs. Eumu John, my siblings, and all those who helped me either directly or indirectly for always being there for me along the way of life. You have and are continually assets to my life, my mentors and above all the best life coaches ever.

May the ALMIGHTY continually increase you in wisdom.

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Last, but not least, I thank the **Almighty God** for giving me strength to overcome difficulties, May His Name be glorified!

Thank you all for making this a reality.

DECLARATION

I AKALLO JESCA declare to the best of my knowledge that the work presented herein is as a result of my own research and has never been submitted to any institution of higher learning for any award whatsoever.

Signature:.....

Date: .....27/05/2016.....

APPROVAL

This final year project report on the investigation of the potential of eggshells as an adsorbent in the treatment of textile wastewater has been written under the supervision of;

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SYMBOLS AND ACRONYMS

NWSC: National Water and Sewerage Cooperation

DR: Direct Reading

&: and

e.g.: for example

NTU: nephelometric turbidity unit

TCU: true colour unit

BOD: Biochemical Oxygen Demand

COD: Chemical Oxygen Demand

TSS: Total Suspended Solids

PH: potential hydrogen

DO: Dissolved Oxygen

UV: ultraviolet

CHAPTER ONE

1.0. INTRODUCTION

This chapter provides the background information for the selected project, the problem statement that describes the context for the study, and the purpose statement that gives us the overall purpose of the study. It further incorporates the objectives and finalizes with the scope and limitations of the project study.

1.1. Background of study

Dyes have been used in many industries for coloration purpose. Color is an important aspect of human world. We like to wear clothes of all kinds of colors and hues, eat food decorated with colors, even our medicines are colorful. Today, there are more than ten thousand dyes available commercially and seven lakh tons of dyes are produced annually. (Ratna, 2012).

Worldwide, the textile dyeing industry consumes large quantities of water and produces large volumes of wastewater from different steps in the dyeing and finishing processes. During the coloration process, a large percentage of the synthetic dye does not bind and is lost to the waste stream (Ratna, 2012). Approximately 10-15% (Al-Qaim, 2011), 50% (M. C. STARLING, 2014) dyes are released into the environment during dyeing process making the effluent highly colored and aesthetically unpleasant. The effluent from textile industries thus carries a large amount of dyes and other additives which are added during the coloring process (Ratna, 2012). However, this wastewater often rich in color, containing residues of reactive dyes and chemicals, such as complex components, many aerosols, high Chroma, high COD and BOD concentration as well as much more hard degradation materials requires proper treatment before being released into the environment.

In Uganda, a case of Fine Spinners Uganda Limited, $78cm^3$ of waste water are generated on average while normally about $196cm^3$ of waste water are generated. This becomes a great threat to the environment when disposed without proper treatment given to it.

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