NEW TREATMENT FOR INDUSTRIAL WASTEWATER OF BATTERIES INDUSTRY

A Thesis
Submitted to the Faculty of Engineering
Ain Shames University for the Fulfillment
of the Requirement of M.Sc. Degree
In Civil Engineering

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Date: - ---/--/2019

Dedication

This thesis is lovingly dedicated to all the close, special and beautiful people in my life.

A special dedication to

THE MEMORY OF MY LATE FATHER

and to

MY SUPPORTIVE MOTHER

and to

My wonderful Family

and finally special dedication to

MY LOVELY FIANCÉE

For encouraging me to complete this work and for always being there for me.

STATEMENT

This dissertation is submitted to Ain Shams University, Faculty of Engineering for the degree of M.Sc. in Civil Engineering.

The work included in this thesis was carried out by the author in the department of Public Works, Faculty of Engineering, Ain Shams University, from August 2016 to October 2018.

No part of the thesis has been submitted for a degree or a qualification at any other University or Institution.

The candidate confirms that the work submitted is his own and that appropriate credit has been given where reference has been made to the work of others

Date: - ---/-- /201

Signature: - ----------

Name: - ***MAHMOUD SHAABAN IBRAHIM FARAG ALLAH***

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ABSTRACT

Name*:* MAHMOUD SHAABAN IBRAHIM FARAG ALLAH

Title*:* "NEW TREATMENT FOR INDUSTRIAL WASTEWATER OF BATTERIES INDUSTRY"

Faculty: Faculty of Engineering, Ain Shams University.

Specialty: Civil Eng., Public Works, Sanitary & Environmental Eng.

Abstract:-

The environmental pollutions which produced from the rapid industrialization become a serious issue, and therefore efficient methods are needed for the different industries. The Heavy metals have stated as urgent pollutants, because of their movement into water ecosystems and because of their toxicity. Many ways managed to remove the heavy metals but with a high cost and therefore there is a need to use a low cost materials and methods for the removal process.

This thesis has been carried out to study the adsorption method using a low cost materials (clay, output trimming tree (ficus)) to remove the heavy metal (lead) from the industrial wastewater and comparing them to a high cost material (activated Carbon).

The study shows that the removal ratio for each material were 94.66 % with activated carbon, 93.45 % with ficuss trees trimming output and 92.25 % with clay.

The study shows that the using of low cost material as clay and agricultural waste as ficus are possible as adsorbent filtration media and they achieve a removal ratio near to the a high cost material as activated carbon which save a lot of cost for industrial wastewater treatment and encourage the factories to use them

The study shows that the removal ratio increases as the media depth increases and as the rate of filtration decreases with lead removal ratio up more to 93 % & 92 % for ficus and clay respectively using the materials as Adsorbent filtration media which their cost not high and don't need a pretreatment before using for the heavy metal removal from the industrial wastewater.

SUPERVISORS

Prof. Dr. Mohamed El Hosseiny El Nadi,
Prof. Dr. Ghada Mohamed Bassioni,
Dr. Mohamed Sobhy Abdel Rahman.

KEY WORDS

Wastewater Treatment, Heavy Metals Removal, Absorption, Application of Agricultural wastes, Clay, lead (II).

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

CHAPTER I

INTRODUCTION

1.1 BACKGROUND & PROBLEM DEFINITION

The environmental pollutions which produced from the rapid industrialization become a serious issue, and therefore efficient methods are needed for the different industries. The Heavy metals have stated as urgent pollutants, because of their movement into water ecosystems and because of their toxicity.

The presented heavy metals in the industrial effluent wastewater is a major environmental pollution concern. Generally the counted heavy-metals which their density go over five (grams / cm^3)[1]. The majority of constituents which are in that classification able to dissolve in water, recognized as toxic as well as carcinogenic constituents. The next constituents are counted heavy-metals : Silver, Copper, Cadmium, Zinc, Gold, Lead, Mercury, Chromium, Tin, Iron, Selenium, Nickel, Arsenic, Manganese, Molybdenum, Cobalt, and Aluminum[1].

Heavy metals are not biodegradable and their existence at streams directs to bioaccumulation in living organisms producing health difficulties in animals, plants, and humans. They could be absorbed as well as stored into the person body causing severe well-being consequences such as cancer, damaged nervous system, organ damage, in addition to acute situations, loss of life. It additionally decreases development in addition to growth[1].

Since even heavy metals with little quantity considered extremely toxic, the elimination of these constituents from waste water come to be the considerable interest matter as a result due to firm regulations. Waste-water rules were founded for lessening human as well as environmental contact to the risky chemicals. These involve boundaries upon the heavy metals kinds as well as concentrations which may be existing in the discharged wastewater[1]. The mix between the toxic wastewater streams and other wastewater streams should never be allowed or then the whole mixture is treated as toxic, that then the burden on the treatment effluent would be increased extremely[2].

1.2 STUDY OBJECTIVE

Heavy metals present with high concentration in the industrial effluent wastewater and these metals have sever effects on the environment and to the human health if they disposed directly to the environment. The heavy metals removal cost from the wastewater is high and therefore this study main purpose is to check the best treatment for removing lead from the wastewater by adsorption with filtration using low cost materials which are easily available.

1.3 SCOPE OF WORK

The work consisted from two main parts, the theoretical work and the experimental work. Each part contains the following:

1.3.1 THEORETICAL PART

The theoretical part included the following:

1- The literature review that covers the following:
   a. Literature review about batteries industry.
   b. Batteries industry wastewater characteristics.
   c. Different stages & methods of wastewater treatment.
   d. Literature review about heavy metals.
   e. Different methods in removing heavy metals.

2- The design of the pilot & experimental program

3- The results analysis & discussions.

4- The thesis writing.

1.3.2 EXPERIMINTAL PART

The experimental part included the pilot description, its program of operation and the laboratory sampling and analysis during each run.