OPTIMIZATION OF STABILIZATION POND DESIGN DUE TO EGYPTIAN CONDITIONS

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

Prepared by

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B.Sc. in Civil Engineering, June 2004
Faculty of Engineering – Ain Shams University

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Date: - ---/--/2012

DEDICATION

I wish to dedicate this work to who suffered to educate, support and encourage me during the thesis work

TO MY PARENTS,

MY BROTHER

Also, I wish to dedicate my thesis to my professor

PROF. DR. MOHAMED EL HOSSEINY EL NADI

For his encouragement and support to complete this work.

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 November 2010 to May 2012.

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: - ---/-- /2012

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

Name: - ***AHMED TAREK ABD EL MONIEM***

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ABSTRACT

NAME*:* - AHMED TAREK ABD EL MONIEM

Title*:* - "OPTIMIZATION OF STABILIZATION POND DESIGN DUE TO EGYPTIAN CONDITIONS"

Faculty : - Faculty of Engineering, Ain Shams University.
Specialty: - Civil Eng., Public Works, Sanitary Eng.

Abstract:-

Stabilization ponds are established in various cities and villages in Egypt there are about 38 ponds covering almost all the regions of the country some of these ponds are working with low efficiency some of them are over designed and some are under designed One of the main problems is the plants are not fenced properly which maximize the wind effect and cause disturbance in the pond performance, some ponds are designed to receive a certain flow but actually it receives much less flow which increases the retention time .

In this study, 8 working WSPs in different locations all over Egypt were monitored and their performances were evaluated with respect to ponds retention time and prevailing climate temperature and humidity conditions. The concept of choosing these locations is to cover the different climate conditions (Temperature, wind, humidity) all over Egypt. These locations had covered regions presented in(Al Behera,Fayoum,WadiAlGadeed,Luxor,Hurghada,SharmEl Sheikh,Areesh & Abu Rudies) Each location had been visited during season's winter, spring, summer& autumn to obtain the different weather conditions and several samples were collected during the day over three days in each season.

It was found that reduced pond retention could work perfectly with operating climate conditions in Egyptian circumstances. Conclusions were drawn to suggest usage either minimum retention period or higher limit of volumetric organic loading that will benefit the minimization of area needed for the treatment plant.

SUPERVISORS
Prof. Dr. Mohamed EL Hosseiny EL Nadi,
Prof. Dr. Mahmoud Abdel Azim,
Dr. Nany Ali Hassan Nasr,

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

CHAPTER I
INTRODUCTION

1-1 BACKGROUND

Stabilization ponds treatment plants are widely used in hot climates and developing countries, due to simplicity, low cost and high efficiency. Several treatment plants were constructed and operated properly in Egypt in last few years.

All present equations concerning the stabilization ponds design depends mainly on the site conditions as climate, type of wastewater and land topography. With the applications of such type of treatment in Egypt, some notifications appeared due to design overload that increases the need for specific Egyptian design equation.

With these increasing interests, it was essential to monitor and evaluate these plants performance for any possible future modifications or suggestions towards more stable technical and financial recommendations, and to allow defining suggested possible design criteria.

1-2 STUDY OBJECTIVES

The main target from this study is to determine an optimum design equation for stabilization ponds that suits the Egyptian conditions.

1-3 SCOPE OF WORK

The study had been done on by conducting site visits to several stabilization ponds in Egypt
The study work included the following:

1. Theoretical work which include data collection about the selected plants and its wastewater characteristics and other parameters affecting plants' performance. This data collection divided to literature review and site visits.
2. Practical work includes field investigation to fulfill different cases of study of WSP plants in Egyptian regions
3. Analysis of field results of influent and effluent wastewater characteristics as pH, BOD, COD and TSS.

That was measured and monitored as the indicating parameters of the performance of the treatment.

1-4 THESIS ORGANIZATION

The thesis will include the following chapters:

1-4-1 CHAPTER I: INTRODUCTION

This chapter includes background about the Stabilization ponds, then study the objective of this study, then scope of the study work which it divided to theoretical work and practical work and finally thesis organization to cover all work done and its conclusions.

1-4-2 CHAPTER II: LITERATURE REVIEW

This chapter includes introduction about stabilization ponds, worldwide applications, and applications in Egypt, in addition to the present equations concerning the stabilization ponds design and parameters affecting design, the notifications appeared due to design overload that affects plant's performance.

1-4-3 CHAPTER III: MATERIALS & METHODS

This chapter represents the practical work done, as it presents the collected data for the selected plants and its wastewater characteristics in addition to the other parameters affecting plants' performance.
It includes the required measured parameters illustrating the site locations, and work intervals. It also highlights the sampling collection methodology and the sampling intervals

1-4-4 CHAPTER IV: RESULTS

This chapter includes presentation for the raw wastewater results for the measured parameters for different WSPs that were taken in our study. All results for each treatment plant during the study period and the results were attached with charts to illustrate the results. The samples were collected from different plants all over Egypt in order to cover and take into account the different climate conditions.

1-4-5 CHAPTER V: DISCUSSION

This chapter includes discussion of the results for each stabilization plant and the aim of this chapter is to study the current situation of the stabilization pond and evaluate the field results with regards to the desirable expected removal efficiency based on the actual condition. After that, the normal design criteria shall be applied to the current plant with respect to SLR and pond dimensions to check plant's efficiency. Accordingly, the actual factor (Coefficient) that has impacts on the temperature to provide the optimum removal efficiency, shall be determined.

1-4-6 CHAPTER VI: CONCLUSION

This chapter includes conclusion for all the study work, and recommendations for applying the new design equation to get the optimum efficiency according to the new equation.