FACULTY OF ENGINEERING IN AIN SHAMS
CIVIL ENGINEERING DEPARTMENT

PERFORMANCE ASSESSMENT OF DIFFERENT MEDIA FOR A BIOLOGICAL FILTER WITHIN LOW COST WASTEWATER TREATMENT UNIT

A Thesis
Submitted to the Faculty of Engineering Ain Shams University for the Fulfillment of the Requirement of M.SC Degree in Civil Engineering

Prepared by

ENG. HATEM MOHAMED TAHA
B.Sc. in civil Engineering 2009,Faculty of Engineering, ASU

Supervisors

Prof. Dr. FIKRY HALIM GHOBRIAL,
Professor of Sanitary & Environmental Engineering
Faculty of Engineering, ASU, Cairo, EGYPT

Prof. Dr. TAREK ISMAIL SABRY,
Professor of Sanitary & Environmental Engineering
Faculty of Engineering, ASU, Cairo, EGYPT

Dr. AHMED SHAFIK ELGENDY,
Associate Professor of Environmental Engineering
Institute of Environmental Studies and Research, ASU, Cairo, EGYPT

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THESIS APPROVAL

EXAMINERAS COMMITTEE SIGNATURE

Prof. Dr. MOHAMED EL SAID ALI BASSIONY …….
Professor of Sanitary & Environmental Engineering Faculty of Engineering, Banha University, Banha, Egypt

Prof. Dr. MOHAMED HASSAN ABD ELRAZEQ …….
Professor of Sanitary & Environmental Engineering Faculty of Engineering, AinShams University ,Cairo, Egypt

Prof. Dr. FIKRY HALIM GHOBRIAL …….
Professor of Sanitary & Environmental Engineering Faculty of Engineering, AinShamsUniversity,Cairo, Egypt

Date: ----/--/2014

DEDICATION

This work takes a period from my life. I wish to dedicate it to whom suffered to educate, prepare, build capacity and help myself to be as I am;

TO

MY FATHER, MY MOTHER,
MY SISTER&MY BROTHER

ALSO TO MY
NIECE

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 December 2009 to December 2013.

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

Date: - ---/---/2014

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

Name:- ***HATEM MOHAMED TAHA***

ACKNOWLEDGMENTS

The candidate wishes deeply to express his gratitude to ***Prof. Dr. FikryHalimGhobrial,*** *Professor of Sanitary & environmental Engineering, Faculty of Engineering, Ain Shams University, for suggesting the problem, his patient guidance, helpful suggestions, sponsoring, supervision, great support, advising this workand preparation of thesis*

Also, great thanks ***toProf.Dr. Tarek Ismail Sabry,*** *Professor of Sanitary & environmental Engineering, Faculty of Engineering, Ain Shams University, Cairo, EGYPT for suggesting the problem, his patient guidance, helpful suggestions, sponsoring, supervision, great support, advising this work and help in laboratory work. and preparation of thesis.*

Sincere thanks are given to ***Dr. AHMED SHAFIK EL-GENDY,*** Assistant Professor of *Environmental Engineering, Institute of Environmental Studies and Research, Cairo, EGYPT,for suggesting the problem, his patient guidance, helpful suggestions, sponsoring, supervision, great support, advising this work and help in laboratory work. and preparation of thesis*

The author expresses hisgreat thanks to the staff and personnel of zennen WWTP and national research center, for help, assistance, facilities, and cooperation in unit operation and laboratory analysis during the preparation of this study.

Also, sincere thanks are to the staff and personnel of ***Sanitary Engineering section, faculty of Engineering, Ain Shams*** *for facilities, encouragement and cooperation during the preparation of this study.*

At the end no words can express my deep thanks and regard to my beloved family

ABSTRACT

Name: ***HATEM MOHAMED TAHA***

Title: **PERFORMANCE ASSESSMENT OF DIFFERENT MEDIA FOR A BIOLOGICAL FILTER WITHIN LOW COST WASTEWATER TREATMENT UNIT**

Faculty: ***Faculty of Engineering, Ain Shams University.***

Specialty: ***Civil Engineering, Public Works, Sanitary Engineering.***

Summary:

Wastewater treatment is one of the important subjects taken into consideration in developing countries. In such countries, the main source of pollution is due to discharging wastewater without adequate treatment into watercourses.

The use of conventional types of wastewater treatment in these countries in the rural areas is hindered by the huge investments and large area requirements of agricultural land. These reasons led the scientific community to seek solutions relying on the use of local products or by-products to establish low cost wastewater treatment systems employing new modified techniques suitable for serving different specific conditions.

Also, the concentration on minimizing of power consumption, maintenance requirements, complicated techniques and imported equipment became one of the main targets for the ongoing studies. This leads to choose the attached growth system after the anaerobic treatment unit to decrease the required land, minimize the construction and operation cost as possible and reach the requirements of law 48.

This study was carried out to check the possibility of applying biological filters following the USBR system. The biological filter receives the Down-flow effluent from the USBR system, which drops through perforated trays to increase the DO in level, before being introduced to the biological filter.

Four selected different filtration packed media were used as aerobic biological filter units. All the media are available in the local market, the tested media (sponge, plastic, Electrical flexible corrugated hoses, and gravel) were used in parallel modules to evaluate the performance of each separately and determine its removal efficiency for the different pollutants represented by the parameters COD, CODs, TSS, and VSS. To achieve the study objectives the tested media were exposed to several hydraulic loading rates and shock load during the experimental program using continuous flow pilot plant running for seven months period.

The use of passive aeration after the anaerobic phases of the treatment increases the dissolved oxygen contents of the anaerobic effluent to reach an average concentration of 5.22 mg/L.

All tested media achieved good removal efficiency of the monitored pollutants under hydraulic loading rate of $2.5m^3/m^2/day$ to $12m^3/m^2/day$ and produced effluent quality that meets Law 48 requirements most of the time.

The best removal efficiency occurred at hydraulic loading rate range of $2.5\text{-}3.75m^3/m^2/day$ for all tested media. The best two media, however, were sponge and plastic.

All the tested media were affected during the shock load and impaired the effluent quality, but after 48 hours effluent quality returned back to the regular background range except gravel.

The sponge media was the best media for all hydraulic loading rates due to the big surface area and the high catchment of water that keep the biofilm wet at low hydraulic loading rate.

KEY WORDS :

Wastewater, Wastewater Treatment, Attached growth system, Biological filter media, low cost treatment system.

WHO ARE THESE SUPERVISORS

Supervisors:

Prof. Dr. FIKRY HALIM GHOBRIAL,
Dr. TAREK ISMAIL SABRY,
Dr. AHMED SHAFIK ELGENDY

ABBREVIATIONS

SYMBOL	MEANING
BOD	Biochemical Oxygen Demand
COD	Chemical Oxygen Demand
TSS	Total Suspended Solids
VSS	Volatile Suspended Solids
TKN	Total Kjeldahl Nitrogen
CODs	Soluble Chemical Oxygen Demand
BAF	Biological aerated filters
DBAF	Dual Biological Aerated Filter
RBC	Rotating Biological Contactors
USBR	Upflow Septic Tank Baffled Reactor
DO	Dissolved Oxygen

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