OPTIMIZATION OF PHOSPHORUS REMOVAL IN EBPR WASTEWATER SYSTEM BY EXTERNAL CARBON SOURCE ADDITON

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: - ---/---/2015

Dedication

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

A special dedication to

my supportive parents

and to

my wonderful family

and finally
a special dedication to

my lovely wife

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 October 2013 to May 2015.

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: - ---/--- /2015

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

Name: - ***AHMED ADEL HASSAN ALI SHARAF***

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ABSTRACT

Name*:* AHMED ADEL HASSAN ALI SHARAF

Title*:* "OPTIMIZATION OF PHOSPHORUS REMOVAL IN EBPR WASTEWATER SYSTEM BY EXTERNAL CARBON SOURCE ADDITION"

Faculty: Faculty of Engineering, Ain Shams University.

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

Abstract:-

The overall goal of this study is to investigate the effect of carbon source (sodium acetate) addition as an application of Enhanced Biological Phosphorous Removal (EBPR) in the modified contact stabilization activated sludge system, by using contact tank as a phosphorus uptake zone and using thickener tank as a phosphorus release zone. The study involved the construction of a pilot plant which was setup in the Quhafa Wastewater Treatment Plant (WWTP), Al-Fayoum, Egypt. Results showed the removal efficiencies of Chemical Oxygen Demand (COD), Biochemical Oxygen Demand (BOD_5) and Total Phosphorus (TP) of this pilot plant were 86%, 85% and 59%, respectively. On the other hand, results showed that sodium acetate addition has decreased the biodegradability of the organic matter by phosphorus accumulating organisms (PAOs) which is represented in the ratio between COD/BOD_5 in the release zone in the thickener as it reached five times. Moreover, addition of sodium acetate caused a turbulence in phosphorus release efficiency in the anaerobic zone where it reached -96%. Finally addition of sodium acetate to the anaerobic zone did not improve the performance of the overall system in general and the release efficiency in particular. In addition, a simple mathematical model for phosphorus release was developed based on a batch test and release rates were measured.

SUPERVISORS

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KEY WORDS

Wastewater treatment, EBPR, contact stabilization, carbon addition, phosphorus release

TABLE OF CONTENTS