OPTIMIZATION OF SLUDGE THICKENING

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

by

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DEDICATION

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

TO MY FATHER SOUL

I wish to dedicate it also to whom ease my life and share in carrying the responsibility to help me

TO MY MOTHER

At the last, I wish to dedicate this work.

TO MY BROTHER AND MY SISTER

STATEMENT

This dissertation is submitted to Ain Shams University, Faculty of Engineering for the degree of PhD. 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 January 2012 to June 2017.

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

Date:- ---/--/2017
Signature:- ----------
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ABSTRACT

Name :- FATMA MAHMOUD ABD EL-SHAFi Emam

Title :- " Optimization Of Sludge Thickening"

Faculty : Faculty of Engineering, Ain Shams University

Specialty : Civil Eng., Irrigation and Hydraulic Department

Summary :

Gravity thickeners are most commonly used in wastewater treatment plants in Egypt. Gravity thickeners are designed so as sedimentation happens due to physical reactions only, but what actually happens is that due to other incomprehensible reactions the sedimentation efficiency is affected. These incomprehensible reactions are the subject of this thesis. This research contains: **Firstly**, Data collecting for available information on the parameters affecting the gravity thickener and the troubles affecting the performance of the gravity thickeners. In addition to visiting some wastewater treatment plants in Egypt for investigations and data collections. **Secondary**, the experimental works have two stages batch-scale lab experiments to determine the best mixture ratio between primary & secondary sludge for thickener and also to determine the retention time to give maximum thickening efficiency, field-scale pilot unit experiments to determine the simulation model for the thickener behavior. **Finally**, discussing both experimental works results and producing the simulation model and its verification. It was concluded from this research as the following:

1. Based on the bench-scale lab experiments the best mixed ratio between primary sludge (PS) and waste activated sludge (WAS) with the gravity thickener is found (40 % PS+ 60 % WAS).
2. From the bench-scale lab experiments, the big effect of biological action was presentable after 16 hrs.
3. The study proved that hydrolysis phase by anaerobic action can be happened from start settling by gravity thickener depends on the sludge characteristics and sludge age.
4. Based on field pilot experiments, the maximum efficiency of gravity thickener for primary sludge is highest than efficiency of mixed sludge (40%PS + 60% WAS) and then efficiency of waste activated sludge with retention time 16 hr.
5. The study model produced a simulation model for the gravity thickener. It was found that the gravity thickener works by three equations depending on retention times and sludge types, thickening efficiency .

Supervisors:

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KEYWORDS

Wastewater Treatment, Sludge Treatment, Sludge thickening.

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