شبكة المعلومات الجامعية
@ ASUNET

بسم الله الرحمن الرحيم

Ain Shams University Information Network
جامعة عين شمس
شبكة المعلومات الجامعية
@ ASUNET

شبكة المعلومات الجامعية

شبكة المعلومات الجامعية

التوثيق الالكتروني والميكروفيلم

شبكة المعلومات الجامعية

جامعة عين شمس

التوثيق الإلكتروني والميكروفيلم

قسم

نقسم بالله العظيم أن المادة التي تم توثيقها وتسجيلها
علي هذه الأقراص المدمجة قد أعدت دون أية تغيرات

يجب أن

تحفظ هذه الأقراص المدمجة بعيدا عن الغبار

ULTRAFILTRATION PRE-TREATMENT FOR SURFACE WATER IN EGYPT

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

Prepared by

ENG. AMIRA MOHAMED NAGY ABDALLAH

B.Sc. in Civil Engineering, June 2012
M.Sc. in Civil Engineering, 2016
Faculty of Engineering, Ain Shams University, Cairo, EGYPT

Supervisors

PROF. DR. MOHAMED EL HOSSEINY ABDEL RAHMAN EL NADI,
Professor of Sanitary & Environmental Engineering
Faculty of Engineering, Ain Shams University, Cairo, EGYPT

DR. NANY ALY HASSAN NASR
Assistant Professor of Sanitary & Environmental Engineering, Faculty of Engineering, Ain Shams University, Cairo, EGYPT

Dr. HOSSAM MOSTAFA HUSSIEN,
Assistant professor of Sanitary & Environmental Engineering, Faculty of Engineering, Ain Shams University, Cairo, EGYPT

2021

ULTRAFILTRATION PRE-TREATMENT FOR SURFACE WATER IN EGYPT

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

Prepared by

ENG. AMIRA MOHAMED NAGY ABDALLAH

B.Sc. in Civil Engineering, June 2012
M.Sc. in Civil Engineering, 2016
Faculty of Engineering, Ain Shams University, Cairo, EGYPT

THESIS APPROVAL

EXAMINERS COMMITTEE	SIGNATURE
Prof. Dr. Hisham Sayed Abd Elhalim Professor of Sanitary & Environmental Engineering Faculty of Engineering, Cairo University	----------
Prof. Dr. Mohamed Sobhy Abd Elrahman Professor of Sanitary & Environmental Engineering Faculty of Engineering, Ain Shams University	----------
Prof. Dr. Mohamed El Hosseiny El Nadi Professor of Sanitary & Environmental Engineering Faculty of Engineering, Ain Shams University	----------

Date: - ---/--/2021

DEDICATION

I wish to dedicate this work to who suffered to educate, prepare, build capacity and help myself to be as I am,

TO

MY MOTHER

&

MY BROTHER

for their encouragement and support to complete this work.

And also great thanks

TO

MY LOVING HUSBAND

for his patient encouragement and support to complete this work.

Also to

MY SON

May it could be his candle for future

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 2018 to April 2021.

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: - ---/-- /2021

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

Name: - ***AMIRA MOHAMED NAGY ABDALLAH IBRAHIM***

ACKNOWLEDGMENT

The candidate is deeply grateful to **Prof. Dr. Mohamed El Hosseiny Abdel Rhman EL Nadi**, *Professor of sanitary and Environmental Engineering, Faculty of Engineering, Ain Shams University for suggesting the problem, being helpful in designing & building the pilot units, encourage, co-operation sponsoring and patient advising during preparation of this work*

Also, deeply thanks to **Dr. Nany Aly Hassan Nasr** *Assistant Professor of sanitary and Environmental Engineering, Faculty of Engineering, Ain Shams University* & **Dr. Hossam Mostafa Hussien,** *Assistant Professor of sanitary and Environmental Engineering, Faculty of Engineering, Ain Shams University, for their help, support and co-operation during the preparation of the study.*

Also, very grateful to the sanitary engineering staff and the laboratory personnel Faculty of Engineering, Ain Shams University for their encouragement and support during thesis preparation.

ABSTRACT

NAME: - AMIRA MOHAMED NAGY ABDALLAH

Title*:* - "ULTRAFILTRATION PRE-TREATMENT FOR SURFACE WATER IN EGYPT"

Faculty: - Faculty of Engineering, Ain Shams University.

Specialty: - Civil Eng., Public Works, Sanitary Eng.

Abstract: -

This study targeted to develop a compact unit with a small size and minimum cost that works as a pretreatment unit for the ultrafiltration modules to reach the maximum benefits from this type of plant. This unit targets to produce water with quality suitable to enter the ultrafiltration modules according to the manufacturer.

The study was divided into two main parts. The first part was concerned with the development of the pretreatment units. There were two units created, one for applying sedimentation process and the other one for applying filtration process. The second part was concerned with testing these units and determine the ability to use them. Four runs with different retention times were used to test the sedimentation unit and each run was repeated three times with three different water sources that had different TSS concentrations. The results proved the suitability of using this unit for the ultrafiltration pretreatment process. On the other hand, seven runs made using different filter media to determine the suitability of this unit. Sand, anthracite coal, and agricultural waste were the three media used in this study as mono, dual or triple filtration processes. Experimental results proved that the triple filtration had the best removal efficiency and the agricultural waste had the worst removal efficiency.

The study concludes mathematical model for the sedimentation process can be used in the design of the sedimentation pretreatment units. Another model created for the filtration process was used to determine the filtration media cost for the required unit. These models recorded error percentages in an acceptable range.

KEY WORDS: Ultrafiltration – Pretreatment – Compact unit- Sedimentation – Filtration

SUPERVISORS

Prof. Dr. Mohamed El Hosseiny Abdel Rahman El Nadi,

Dr. Nany Aly Hassan Nasr,

Dr. Hossam Mostafa Hussien,

Table of Contents

List of Tables