بسم الله الرحمن الرحيم

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EVALUATION OF TEMPERATURE EFFECT ON THE PERFORMANCE OF A FULL SCALE WWTP SIMULATED THROUGH EXTENDED ASM1

By

Noha Adel Helal Elhattab

A Thesis Submitted to the
Faculty of Engineering at Cairo University
in Partial Fulfillment of the
Requirements for the Degree of
DOCTOR OF PHILOSOPHY
in
Civil Engineering – Public works

FACULTY OF ENGINEERING, CAIRO UNIVERSITY
GIZA, EGYPT
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Title of Thesis:

Evaluation of temperature effect on the performance of a full scale WWTP simulated through extended ASM1

Key Words:
COD; Extended Activated Sludge Model No. 1; Operating parameters; Temperature; WWTP

Summary:
A simulation model was adapted for the 6th of October wastewater treatment plant (WWTP) located in Cairo, Egypt. The study aims to investigate the effect of variable temperature on treated effluent wastewater with regards to various operational parameters. The temperature in the arid region where the plant is located varies significantly between summer and winter. The simulation model was created using the MATLAB platform and applies Extended Activated Sludge Model No. 1 (ASM1) equations for WWTP modeling. This model reflected the equations of ASM1 with modified Monod kinetics for the dissociation of soluble biodegradable organic substrates into unionized organic substrates to be utilized by aerobic heterotrophs and autotrophs. Model calibration and sensitivity analyses of kinetic parameters were conducted for model validation. A comprehensive study was performed to examine the effect of various operating parameters on the removal of chemical oxygen demand (COD) at different temperatures using the calibrated model. The operational conditions studied are dissolved oxygen (DO), hydraulic retention time (HRT), and mixed liquor volatile suspended solids (MLVSS).

Disclaimer

I hereby declare that this thesis is my own original work and that no part of it has been submitted for a degree qualification at any other university or institute.

I further declare that I have appropriately acknowledged all sources used and have cited them in the references section.

Name: Noha Elhattab   Date: /   /

Signature:

Dedication

This Thesis is dedicated to my role model that I have always looked up to, Prof. Dr. Ibrahim Elhattab; my uncle, my boss and my mentor who passed earlier this year. May he rest in peace.

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I would like to express my great appreciation to Professor Dr. Hisham Abdel Halim and Dr. Minerva Edward, my research supervisors, for all the support and encouragement they gave me. Without their guidance and constant feedback this PhD would not have been achievable.

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