

Mona Maghraby



# بسم الله الرحمن الرحيم

مركز الشبكات وتكنولوجيا المعلومات

قسم التوثيق الإلكتروني



Mona Maghraby



# جامعة عين شمس

التوثيق الإلكتروني والميكروفيلم

## قسم

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





Cairo University

# **EVALUATING THE PERFORMANCE OF MICROBIAL DESALINATION CELLS SUBJECTED TO DIFFERENT OPERATIONAL CONDITIONS**

By

**Mostafa Ragab Ibrahim**

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  
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Approved by the  
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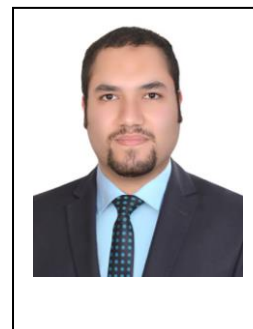
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FACULTY OF ENGINEERING, CAIRO UNIVERSITY  
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**Title of Thesis:**

Evaluating the Performance of Microbial Desalination Cells Subjected to Different Operational Conditions

**Key Words:**

Desalination, substrate concentration; external resistance; temperature; SEM images

**Summary:**

Operational conditions have a tremendous effect on the performance of Microbial Desalination Cells (MDC). In this study, the MDCs performance was comprehensively investigated under three phases. In the first phase, the MDCs were tested at three different temperatures zones. The increase in temperature resulted in reduction in the internal resistance which improves the desalination. It was demonstrated that the MDCs are adaptable to function at different operation temperatures. In the second phase, the MDCs was tested under different substrate strengths. Operation of the MDC using high concentration substrate revealed higher internal resistance and lower performance due to the substrate inhibition effect. It was found that feeding the MDC with low to medium substrate concentration with continuous feeding at short batch cycle could achieve the best COD removal efficiency, CEs and voltage generation compared with operating the MDCs at high substrate concentration over long batch cycles. In the third phase, the MDCs the performance of MDCs was investigated concurrently under different substrate strengths and variable external resistances. The external resistance was found to have significant effect on COD removal and CEs. The desalination pattern of the MDCs tends to be very close to each other at high external resistances above due to limitations of electron flow regardless the substrate concentration.

# **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: Mostafa Ragab

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Signature:

# **Dedication**

*To my lovely family*



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