



شبكة المعلومات الجامعية
التوثيق الإلكتروني والميكروفيلم

بسم الله الرحمن الرحيم



MONA MAGHRABY



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شبكة المعلومات الجامعية التوثيق الإلكتروني والميكروفيلم



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MONA MAGHRABY



Cairo University

EXPERIMENTAL ANALYSIS OF INDIRECT FREEZE DESALINATION WITH AND WITHOUT MAGNETIC FIELD EXPOSURE

By

Hebatallah Mohamed Shawky Elsayed Abdelmoaty

A Thesis Submitted to the
Faculty of Engineering at Cairo University
in Partial Fulfillment of the
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in
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Title of Thesis:

Experimental Analysis of Indirect Freeze Desalination with and without Magnetic Field Exposure

Key Words:

Freeze Desalination; Supercooling; Magnetic Field; Salt Reduction; Magnetic Flux Intensity

Summary:

A comprehensive understanding of the influence of freeze desalination (FD) parameters on salt reduction is essential to increase the efficiency of the FD process. In this thesis, an experimental setup with a suspension freezing system has been utilized to quantify the weight of influence of different FD parameters on salt reduction through robust parametric analysis. Additionally, external magnetic fields (MF) is introduced to assess the effect of magnetic flux density, the configuration of electromagnets, and electric current type (AC and DC) on salt reduction. Without MF exposure, the results reveal that the rate of cooling below 12 C° (R12°) is the most influential parameter in the process. With MF exposure, the results indicate that (1) the intensity of MF should be compatible with the feed salinity, and (2) the percentage of salt reduction increases when the magnetic flux density and the Lorentz force increase.

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.

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Nomenclature

Nomenclature

Symbols:

R12⁻ Rate of cooling below 12 C° in C°/min

Vol. Volume of produced ice in L

C_i Initial feed concentration in g/L

B Magnetic field strength

dB/dx Change of magnetic field strength with distance

Acronyms:

SR Salt reduction (g/L)

FD Freeze Desalination

MF Magnetic Field

ED Electro-dialysis

EDR Electro-dialysis reversal

MED Multi effect distillation

VCD Vapor compression distillation

MSF Multistage flash distillation

RO Reverse Osmosis

MF Microfiltration

UF Ultrafiltration