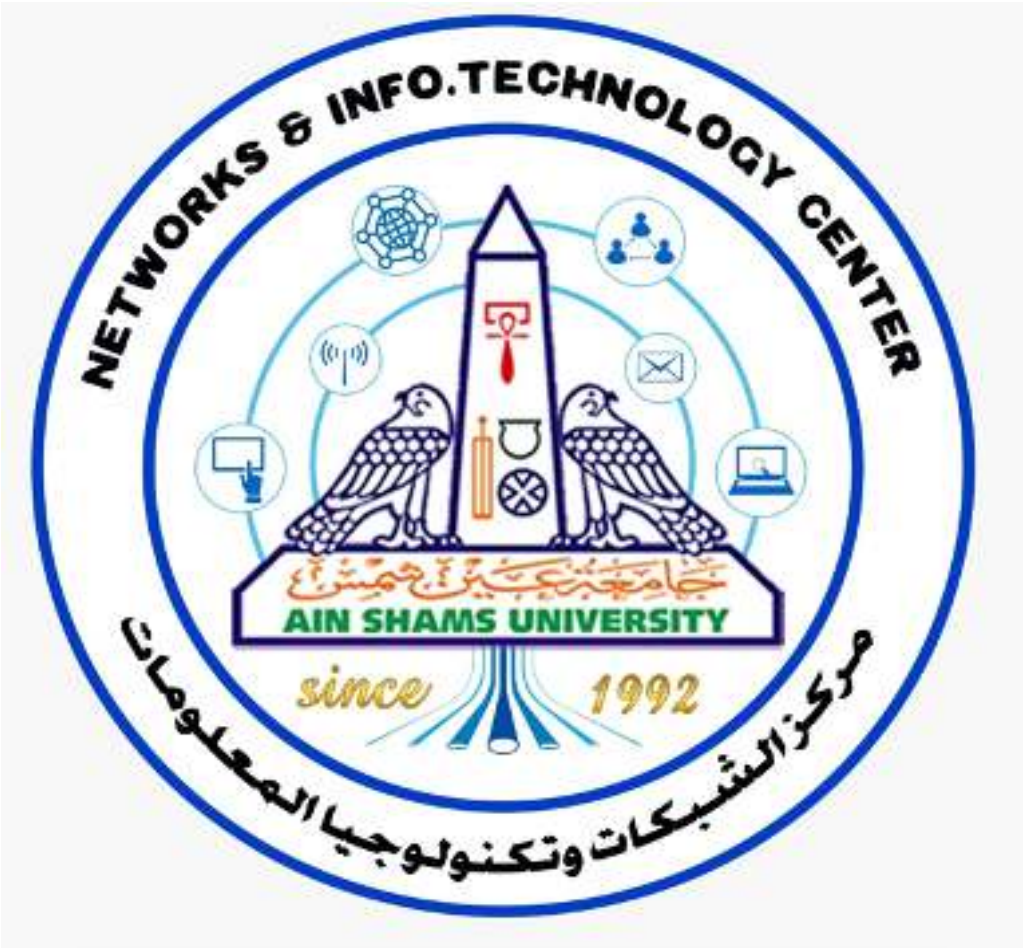
Mona Maghraby

بسم اللّه الرحمن الرحيم

مركز الشبكات وتكنولوجيا المعلومات

قسم التوثيق الإلكتروني



Mona Maghraby

جامعة عين شمس

التوثيق الإلكتروني والميكروفيلم

قسم

نقسم باللّه العظيم أن المادة التي تم توثيقها وتسجيلها

علي هذه الأقراص المدمجة قد أعدت دون أية تغيرات

EFFECT OF DRILLING FLUID TEMPERATURE ON FORMATION FRACTURE PRESSURE GRADIENT

By

Ahmed Mostafa Mokbel Ahmed Samak

A Thesis Submitted to the
Faculty of Engineering at Cairo University
in Partial Fulfillment of the
Requirements for the Degree of
MASTER OF SCIENCE
in
Petroleum Engineering

FACULTY OF ENGINEERING, CAIRO UNIVERSITY

GIZA, EGYPT

2019

EFFECT OF DRILLING FLUID TEMPERATURE ON FORMATION FRACTURE PRESSURE GRADIENT

By

Ahmed Mostafa Mokbel Ahmed Samak

A Thesis Submitted to the
Faculty of Engineering at Cairo University
in Partial Fulfillment of the
Requirements for the Degree of
MASTER OF SCIENCE
in
Petroleum Engineering

Under the Supervision of

Prof. Dr. Abdel-Alim Hashem El-Sayed

.....
Professor of Petroleum Engineering
Department of Mining, Petroleum and Metallurgy
Faculty of Engineering, Cairo University

FACULTY OF ENGINEERING, CAIRO UNIVERSITY

GIZA, EGYPT

2019

EFFECT OF DRILLING FLUID TEMPERATURE ON FORMATION FRACTURE PRESSURE GRADIENT

By

Ahmed Mostafa Mokbel Ahmed Samak

A Thesis Submitted to the
Faculty of Engineering at Cairo University
in Partial Fulfillment of the
Requirements for the Degree of
MASTER OF SCIENCE
in
Petroleum Engineering

Approved by the
Examining Committee

_____

Prof. Dr. Abdel-Alim Hashem El-Sayed, **Thesis Main Advisor**

Faculty of Engineering, Cairo University

_____

Prof. Dr. Fouad Khalaf Mohamed, **Internal Examiner**

Faculty of Engineering, Cairo University

_____

Prof. Dr. Mohamed Mahmoud El-Assal, **External Examiner**

CEO of Triple L Oil Services

FACULTY OF ENGINEERING, CAIRO UNIVERSITY

GIZA, EGYPT

2019

Engineer's Name: Ahmed Mostafa Mokbel Ahmed Samak
Date of Birth: 01/11/1990
Nationality: Egyptian
E-mail: ahmed.mostafa.samak@gmail.com
Phone: +201068600981
Address: 15 Samak St, Abu-Kabeer, Sharkia.

Registration date: 01/10/2012
Awarding Date: / /2019
Degree: Master of Science
Department: Petroleum Engineering

Supervisors: Prof. Dr. Abdel-Alim Hashem El-Sayed.

Examiners:

Prof. Dr. Abdel-Alim Hashem El-Sayed.

Prof. Dr. Fouad Khalaf Mohamed.

Prof. Dr. Mohamed Mahmoud El-Assal.
CEO of Triple L Oil Services

Title of Thesis:

Effect of Drilling Fluid Temperature on Formation Fracture Pressure Gradient.

Key Words:

Temperature Distribution, Thermal Effect, Wellbore Stability, Fracture Gradient.

Summary:

In this thesis, in order to predict the formation fracture gradient in high-temperature formations, a simulation model of the temperature field around the borehole during circulation is established. The effect of temperature change on the formation fracture pressure gradient around the borehole is analyzed and simulated. This effect will be important for HPHT and deep-water wells to reduce the possibility of losses, predict the apparent kick and then save rig time.

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: Ahmed Mostafa Mokbel Ahmed Samak Date: 8/4/2019

Signature:

DEDICATION

I feel that no one worth this dedication but my parents.

ACKNOWLEDGEMENT

I thank Allah the Almighty for giving me the power and patience to complete this research. I would also like to thank my parents for encouraging and supporting me throughout my life and especially during working on my research. I want to express my great appreciation to Dr. Abdel-Alim Hashem for his valuable and constructive suggestions during this research work.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

NOMENCLATURES

A_a	:	Cross-sectional area of inside of the annulus, ft^2.
A_p	:	Cross-sectional area of inside of the drill-pipe, ft^2.
APL	:	Annular pressure loss, psi.
B	:	Skempton's pore pressure coefficient.
BG	:	Background gas.
BPH	:	Barrel per hour.
C_f	:	Specific heat of formation, BTU/(lb.^{o}F).
C_m	:	Specific heat of drilling fluid, BTU/(lb.^{o}F).
CHTC	:	Convective heat transfer coefficients.
D	:	Diameter, in.
DHCT	:	Downhole circulating temperature.
DPL	:	Drill-pipe pressure loss, psi.
d_e	:	Equivalent diameter of a flow channel, in.
d_h	:	Hole diameter, in.
d_{pi}	:	Drill-pipe inside diameter, in.
d_{po}	:	Drill-pipe outside diameter, in.
E	:	Young's Modulus.
EMW	:	Equivalent mud weight.
ERD	:	Extended reach drilling.
FG	:	Fracture gradient, (PPG).
G	:	Shear modulus, psi.
gpm	:	Gallon per minute.
H	:	Well depth TVD, ft.
H_m	:	Well measured depth, ft.
HPHT	:	High pressure high temperature.
h_a	:	Coefficient of heat transfer of fluid in annulus, BTU/day.ft^2-^{o}F.
h_p	:	Coefficient of heat transfer of fluid in drill-pipe, BTU/day.ft^2-^{o}F.
k	:	Consistency index.
k_p	:	Thermal conductivity of drill-pipe, BTU/ft.^{o}F.hr.
k_f	:	Thermal conductivity of formation, BTU/ft.^{o}F.hr.