DEVELOPMENT OF HYDRAULIC MODEL FOR FOAM DRILLING IN VERTICAL WELLS

By

Seydou Sinde

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

PETROLEUM ENGINEERING

FACULTY OF ENGINEERING, CAIRO UNIVERSITY

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Under the Supervision of

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B.Sc. Degree in Petroleum Engineering, Al Azhar University, (2006)

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Title of Thesis:

DEVELOPMENT OF HYDRAULIC MODEL FOR FOAM DRILLING IN VERTICAL WELLS

Key Words:
UBD; Foam; hydraulics; Rheology, Cuttings.

Summary:
In this work, a new development of foam drilling hydraulic model and converting this model to user interface program are proposed. They can be used to better simulate the foam drilling hydraulic calculations for vertical wells. The development model considers foam as a Non-Newtonian power-low fluid in spite of the dispute that still persists among the researchers. Results of the proposed model revealed that the foam flow is greatly affected by the injection pressures, injection flow rates (liquid and gas flow rates), bottomhole temperature, drilling rate (ROP), cutting sizes and densities, formation fluid influxes and the surface back pressure. The model also proposes a try-and-error procedure to initially determine the best selections of the injection pressure and the injection rates of both liquid and gas.The model evaluation and validation were tested by running the program on two actual wells drilled underbalanced with foam in the Middle East with an absolute average error that could not exceed 2.56 %in the first well and 10.85 % in the second well, andthese are very good and encouraging results.

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Dedication

This thesis is dedicated to my parents, father and mother, for their permanent encouragement. These two labor couples, in spite of the limitation of their educational levels, did all what they could to let me trace the path of the knowledge. They have never thought one day about themselves as long as I am in need of any financial matter. I have always been their priority because of the precious consideration and great respect they put to the knowledge and the knower. So, if anyone is better than the knower, it is certainly, his parents without whom the knower would not be what he/she is.May Allah bless both of you!And today, I openly show to the all world the fruits of your tiredness and the results of your endurance in terms of this PhD thesis.

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