A FRAMEWORK FOR RAPID NUMERICAL WELL TEST ANALYSIS USING AN OPEN SOURCE SIMULATOR

By
Ahmed Galal Al-Qassaby Al-Metwally

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
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Under the Supervision of

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Title of Thesis:

A Framework for Rapid Numerical Well Test Analysis Using an Open Source Simulator

Key Words:
Well Testing; Simulation; Unstructured Grids; MRST; Eclipse

Summary:
In conjunction with the Open Porous Media (OPM), SINTEF Company in Oslo have released the Matlab Reservoir Simulation Toolbox (MRST) aiming to function as an efficient platform for implementing new ideas and discretization methods in reservoir simulations applications. MRST has been developed as an open source program under the General Public License (GPL[1]), and in this thesis, the author intends to modify the existing source code of MRST (Release: 2016b) to implement an unstructured gridding algorithm has the ability to conform the basic geological features of the reservoir as an extension to the black oil framework. The governing equations are evaluated using the finite-volume method and the system of equations is solved fully-implicitly using the Newton-Raphson method. The created model in this thesis is used to build a numerical well testing models to tune the analytical solution results, validated versus the recorded pressure signals from the test, the analytical type curves, and Schlumberger reservoir simulator; Eclipse, to give a better representation for the geological features and the petro-physical properties of the reservoir using an easy procedure to construct the grid and to assign these properties.

[1] http://www.gnu.org/licenses/gpl.html

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I would like to express my gratitude to my supervisors, Prof. Mohammed H. Sayyouh and Prof. Ahmed H. El-Banbi. I would like to thank them for providing valuable feedback, input, constructive criticism and support during the course of this thesis.

Dedication

I wish to dedicate this thesis to my family for their continued support and encouragement.

Table of Contents

List of Tables