Ain Shams University

Faculty of Science

Department of Geophysics

Hydrocarbon Evaluation and Geostatical Modeling of The Sab'atayn Formation (Upper Jurassic) in Wadi Bana Oil Field, Marib Shabwa Basin, Republic of Yemen.

By

Nabeel Abdulraheem Saif Abdoh Al-Azazi

Aden University- Yemen.
B. Engineering Geology, Faculty of Oil and Minerals. Aden University- Yemen (2003).
M. Sc. Applied Geophysics, Geology Department, Faculty of Science, Menoufiya University- Egypt (2010).

A Thesis

Submitted to the Geophysics Department, Faculty of Science, Ain Shams University for the Degree of Doctor of Philosophy of Science
(Reservoir Characterization)

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Approval Sheet

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Advisors……..

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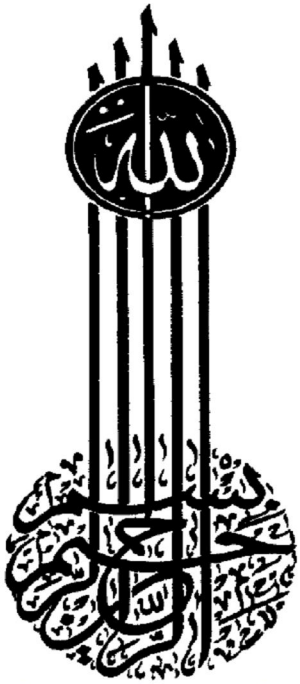

(شَهِدَ اللَّهُ أَنَّهُ لا إِلَهَ إِلا هُوَ وَالْمَلائِكَةُ وَأُولُو
الْعِلْمِ قَائِمًا بِالْقِسْطِ لا إِلَهَ إِلا هُوَ الْعَزِيزُ الْحَكِيمُ)

[سورة:آل عمران - الآية 18]

الإهـــداء

إلى روح أبي الطاهرة طيب الله ثراه ..

رحمـــه الله تـعـالى ....ووسـع مـدخـلـه ...

وإلى من تتسابق الكلمات لتخرج معبرة عن مكنون ذاتها ..

من علمتني الصبر و ساندتني بالدعاء ...أمي اطال الله في عمرها ..

وبكل معاني الحب والوفاء الى زوجتي الغالية فهي من أعطتني حبا

واهتماماً ..ومنحتني دعماً ومساندة وتشجيعاً ...

الى فلذات كبدي , وبهجتي في الحياة أولادي ..

ريهـام و رغـــد و أنيســـة و عبـد الـــرحـــيم..

انبتهم الله نباتاً صالحاً ..وأمدهم بالصحة والعافية ...

والى أخواني وأخواتي..

نبيل عبدالرحيم العزعزي

ABASTRACT

The study area is located in the center of block 18 which located between (15° 06' 10" – 16° 03' 13" N) and (45° 02' 38" – 46° 19' 49" E) and approximately 15 Km northwest of Alif Oil field, in the central part of Marib - Shabwa Basin, which located between (14° 40' 00" – 16° 30' 00" N) and (44° 40' 00" – 48° 30' 00" E) and it has a NW-SE general direction. It extends southward from Al-Jawf to Shabwa governorates. The basin, which is about 250 km long and widens from about 30 km in the southeast to about 80 km in the central part. The studied area involves twelve oil wells including (nine wells and three sidetracks) located between (15° 37' 25" - 15° 38' 55" N) and (45° 40' 38" - 45° 42' 59" E) within Wadi Bana Oil Field which located between (15° 37' 10" - 15° 39' 54" N) and (45° 40' 17" - 45° 44' 08" E).

The first part of the present work is statistical analysis for 260 core analysis data in two wells: WB_12 and WB_13. The statistical analysis for data show a good reservoir potential. The porosity – permeability relationships are determined with high correlation coefficient reflect the homogeneity of pore space types. These relationships between porosity and grain density reflected that the grain density of the studied member depends mainly on the porosity.

The second part analyze the hydrocarbon potentials which were calculated and interpreted using the estimated petrophysical parameters derived from well log analysis. It was evaluated through the vertical and lateral distribution of the hydrocarbon occurrence in the study area. This part of thes study is related to subsurface mapping of the members existing in the study area. These maps include thickness and facies maps of the members in the study area. These maps were concluded from the variations in the petrophysical parameters.

A number of Neutron-Density crossplots, Neutron-Sonic crossplots and M-N crossplots relationships have been constructed to help identification of the lithology, the value of the porosity and in addition to the gas and clay effect, Results of well log analysis were used in the evaluation of hydrocarbon potential in the study area. Pickett's plots determined the cementation exponent (m) for this

section showing different values ranging from 1.68 to 1.88 which indicate the presence of consolidated sandstones.

A study of lateral, vertical reservoir connectivity gas, oil and water through study between depth and pressure plot.

Finally a 3D static model has been carried out for the Upper Jurassic Sab'atayn Formation (Alif Member and Seen Member) Wadi Bana Oil Field. It shows the modeling of the lithofacies, and petrophysical parameters (porosity, permeability, and water saturation). The current study shows that the volume of total stock tank oil originally in place volume (STOOIP) 47 million RB, gas initially in place volume (GIIP) 258 billion SCF, recoverable oil 28 million STB and recoverable gas 219 billion SCF for Wadi Bana oil field and that number is very close to that of SEPCO study (2009) which is the most recent study.

Keywords:-Yemen, Marib Shabwa Basin, Wadi Bana Oil Field, Upper Jurassic, Sab'atayn Formation, Alif Member, Seen Member, Porosity, Permeability, water Saturation, Hydrocarbon evaluation, Geostatical Modeling, Stock Tank Oil Originally in Place and Gas Initially in Place Volume.

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The author

Nabeel Abdulraheem Al-Azazi

Contents