Petrophysical analysis of Qadirpur # 3 well, central Indus basin Pakistan

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PETROPHYSICAL ANALYSIS OF QADIRPUR # 3 WELL, CENTRAL INDUS BASIN PAKISTAN

A thesis submitted to Bahria University Islamabad, in partial fulfillment of the requirement for the degree of BS in Geology

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IN THE NAME OF ALMIGHTY ALLAH

THE MOST BENEVOLENT

THE MOST MERCIFUL

DEDICATION

The treatise has been dedicated to our parents, who have always supported us through thick and thin in every sphere of life and given us the moral and financial support along with their great practical advices.

ABSTRACT

The main objective of the study was to carry out petrophysical analysis to evaluate the hydrocarbon potential of Qadirpur # 3 well. The purpose has been achieved by utilizing complete suite of wire line logs and the available well data. All the reservoir zones were evaluated for the hydrocarbon potential in detail using set of equations and different formation evaluation charts made by Schlumberger. The methodology adopted included measurement of shale volume by employing gamma ray log, estimation of porosity using density and neutron log, estimation of effective porosity, calculation of resistivity of water utilizing spontaneous potential log, evaluation of saturation of water and hydrocarbon saturation using Archie equation. The Average Shale Volume calculated in Sui Main Limestone Zone 3, Sui Upper Limestone Zone 2 and Habib Rahi Limestone Zone 1 are 20.44%, 14.33% and 15.72% respectively. The Average Porosity determined by NPHI (CNL) and RHOB (LLD) in Sui Main Limestone Zone 2, Sui Main Limestone Zone 3 and Habib Rahi Limestone Zone 1 are 23.55%, 20.27% and 19.93% respectively. The Average Effective Porosity determined in Sui Main Limestone Zone 3, Habib Rahi Limestone Zone 1 and Sui Upper Limestone Zone 2 are 16.63%, 16.32% and 9.21% respectively. The Average Water Saturation determined in Sui Upper Limestone Zone 2, Habib Rahi Limestone Zone 1 and Sui Main Limestone Zone 3 are 75.67%, 11.97% and 23.71% respectively. The Average Hydrocarbon Saturation determined in Habib Rahi Limestone Zone 1, Sui Main Limestone Zone 3 and Sui Upper Limestone Zone 2 are 88.02%, 64.52% and 24.23% respectively. The Density and Neutron cross plot chart reveal the reservoir lithology of Qadirpur # 3 well as Sui Main Limestone and the Habib Rahi Limestone. On the basis of above mentioned results the Habib Rahi Limestone Zone 1 and Sui Main Limestone Zone 3 are the productive reservoir zones of natural gas.

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ABBREVIATIONS

Rxo	Resistivity of Flushed Zone
Rmc	Resistivity of Mud Cake**,**
Dh	Borehole Size
Rm	Drilling Mud
Rmf	Mud Filtrate
Rmc	Mud Cake
CNL	Compensated Neutron Log
PEF	Photo-Electric Factor
LLS	Laterolog Shallow
LLD	Laterolog Deep
MSFL	Microsphericaly Focused Log
SP	Spontaneous Potential
Ec	Electrochemical Potential
(Em)	Shale or Membrane Potential
(Elj)	Liquid Junction Potential
(Ek)	Electro Kinetic Potential
B.H.T	Borehole Temperature
Φn-d:	Average Porosity
Φn	Neutron Porosity
Φden	Density Porosity
Ma	Million Years
Fm	Formation
V_{sh}	volume of shale
GR_{log}	Gamma ray reading of formation

GR_{min} Gamma ray minimum

GR_{max} Gamma ray maximum (shale)

ρ_{ma} matrix density

ρ_b formation bulk density

ρ_f fluid density

F formation factor ($a/\emptyset_A^m$)

A turtuosity factor

M constant, cementation exponent

Essp Static Spontaneous Potential

H Mud Cake Thickness

Sh Saturation of Hydrocarbons

Sw Saturation of Water

Rmfeq Resistivity of Mud Filtrate Equivalent

D and PL Development and Production Lease

OGDCL Oil and Gas Development Company Limited

PPL Pakistan Petroleum Limited

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