2D SEISMIC INTERPRETATIONOF CHAKWAL AREA, ROCK PHYSICAL AND PETROPHYSICAL ANALYSIS OF CHAK NAURANG-01 WELL, UPPER INDUS BASIN, PAKISTAN

A thesis submitted to Bahria University, Islamabad in partial fulfillment of the requirement for the degree of B.S in Geophysics

IJAZ UL HAQ

AFTAB ULLAH BAIG

WAHEED ANWER

Department of Earth and Environmental Sciences

Bahria University, Islamabad

2012

ABSTRACT

Migrated seismic lines 782-CW-11,782-CW-24, 782-CW-26, 855-CW-01, 855-CW-03, 881-CW-06 and Well logs of well CHAK NAURANG-01 of CHAKWAL area were obtained from the Land Mark Resources with prior approval from the Directorate General of Petroleum Concession for carrying out this study.

Interpretation of seismic lines shows the presence of a pop up structure in the area. One main fault which is a north dipping south verging fault is followed by small back thrusts caused by the continuing force coming from Indian plate towards the Eurasian plate. On the basis of Rock Physics and several Engineering properties of rocks were calculated to investigate the behaviour of seismic velocities in the sub surface and it confirms the presence of fluid. FinallyPetrophysical analysis we concluded that the carbonates of Chorgali and Salt Range formations bear secondary porosity but mostly they are tight, SW and SH indicates that well is 70 to 80% water saturated and very few or un economical saturation of hydrocarbon.

CONTENTS

CHAPTER 1
INTRODUCTION

1.1	General Introduction	1
1.2	Introduction to the study area	2
1.3	Objectives of research	2
1.4	Data obtained for interpretation	4

CHAPTER 2
GEOLOGY AND TECTONICS OF THE AREA

2.1	Geology of the area	5
2.2	Tectonic setting of the Eastern Salt Range/Potwar Plateau	8
2.3	Stratigraphy of the area	8
2.4	Regional depositional history	9
2.5	Petroleum geology of the area	12
2.6	Production history of potwar	13
2.7	Petroleum system	13

CHAPTER 3
SEISMIC ACQUISITION

3.1	Introduction	14
3.2	Recording parameters	20
3.3	Source	20
3.4	Acquisition parameters of available data	21
3.5	Receivers	22

CHAPTER 4
SEISMIC DATA PROCESSING

4.1	Introduction	23
4.2	Processing Sequence	25

CHAPTER 5

SEISMIC DATA INTERPRETATION

5.1	Introduction	28
5.2	Interpretation steps	28
5.3	Horizon and fault marking	28
5.4	Picking and correlation of reflector	29
5.5	Fault location	29
5.6	Closing loops	30
5.7	Seismic sections	31
5.8	Time depth chart	34
5.9	Well to seismic tie	35
5.10	Time sections	42
5.11	Depth sections	45
5.12	Time Contour Map	49
5.13	Average velocity graph	50
5.14	Depth contour map	52
5.15	Geo-seismic section	53

CHAPTER 6

PETROPHYSICAL ANALYSIS

6.1	Introduction	54
6.2	Flow chart of petrophysical analysis	54
6.3	Raw log curves	55
6.4	Editing of well logs	55
6.5	Marking zone of interest	55
6.6	Identification of lithology	55
6.7	Calculation of volume of shale	55
6.8	Porosity calculation	57
6.9	Effective porosity	58
6.10	Resistivity of water	59
6.11	Saturation of water	61
6.12	Saturation of hydrocarbons	61

CHAPTER 7

ROCK PHYSICS

7.1	Introduction	65
7.2	Objectives	65
7.3	Elastic parameters	66

7.4 Young's modulus 67
7.5 Shear modulus or modulus of rigidity 67
7.6 Bulk modulus 68
7.7 Poisson's ratio 69
7.8 Lame's constant 69
7.9 Well logs 69
7.10 Formulas 70
7.11 Calculation of V_p 70
7.12 Calculation of V_s 71
CONCLUSIONS 79
REFERENCES 80