

2D Interpretation of Seismic Reflection Data of Line 996-BTM-28



BY

MALIK MATIULLAH

BS GEOPHYSICS

Reg# 13670

Department of Earth & Environmental Sciences

BAHRIA UNIVERSITY

KARACHI CAMPUS

2008-2012

ACKNOWLEDGEMENT

All thanks to **Almighty Allah** who gives me strength and courage to complete my study of thesis and then I am awfully grateful to my supervisor M. Jahangir Khan who's inspiring guidance, remarkable suggestions, constant encouragement, keen interest, constructive criticism and friendly discussions enabled me to complete this thesis work.

My sincere thanks go to Head of Department Dr. Seema Jilani and senior faculty members Prof. Dr. Shamim Ahmad Siddiqui, Ms. Shaista Iftikhar, Mr. Zahid Ilyas, Ms. Naghmana Zafar and Mr. Farhan Shehrazai for helping me in entire academic career. Wide knowledge and logical way of them have been of great value for me.

My heartiest gratitude to my parents and siblings, who encouraged me. I also like to pay utmost thanks to my friends Aftab Ahmed, Waseem Ali Asghar, Muhammad Faheem Akram, Ahsan Majeed, Abid Abdullah and Zahid Iqbal who helped me whenever I needed their help.

ABSTRACT

A final stacked seismic section provided by Oil & Gas Development Company Limited (OGDCL) for the interpretation, based on 60 fold data. Survey was conducted over the BITRISM BLOCK, Southern Indus Basin of Sindh Province.

Processed NMO velocity information on different shot points, as a function of time, on the line is available from which average velocity is calculated. The velocities are plotted versus time to obtain the velocity function for the preparation of time section and depth section of the given line.

In the given seismic section line 996-BTM-28, four strong and continuous reflections with moderate amplitude named as R_1 , R_2 , R_3 and R_4 are picked. Two faults have been marked in R_4 on the seismic section. The identified faults are normal faults.

Contents

1. INTRODUCTION

1.1) Introduction of Study Area.....	1
1.2) The Study -Exploration Geophysics	2
1.2.1) Exploration Steps.....	2
1.3) Objectives of the Project	3
1.4) Base Map.....	4
1.5) Seismic Line Parameters	5
1.6) Length Of Seismic Line	7

2. GEOLOGY OF THE AREA

2.1) Introduction	8
2.2) Tectonic zones of Pakistan.....	8
2.3) Sedimentary basin.....	10
2.4) Upper Indus basin	11
2.4.1) Kohat sub basin	11
2.4.2) Potwar sub basin.....	11
2.4.3) Stratigraphy of upper Indus basin.....	11
2.5) Southern Indus basin.....	11
2.5.1) Thar platform.....	12
2.5.2) Karachi trough	12
2.5.3) Kirthar fore deep.....	12
2.5.4) Kirthar fold belt	12
2.5.5) Offshore Indus	12
2.6) Geologic / Tectonic Boundaries	13
2.7) Lower Indus basin.....	13
2.7.1) Stratigraphy of lower Indus basin.....	13
2.8.1) Mesozoic.....	15
2.8.1.1) Triassic.....	15

2.8.1.2) Jurassic.....	15
2.8.1.3) Cretaceous	15
2.9) Source rock of lower Indus basin.....	15
2.11) Reservoirs rocks of southern Indus basin	16

3. SEISMIC METHODS

3. 1) Introduction.....	17
3.2) Elasticity	17
3.2.1) Elasticity of Earth and its Layer:	17
3.2.2) Theory of Elasticity:	18
3.2.3) Elastic Modulus:	20
3.2.4) Comparative analysis of Elastic Modulus of various rocks:	21
3.3) Elastic waves.....	22
3.3.1) Surface waves	22
3.3.2) Body waves.....	23
3.4) Basic wave propagation principles:	23
3.4.1) Geometrical spreading or Spherical spreading.....	24
3.5) Seismic Refraction Method:	27
3.6) Seismic Reflection Method:.....	29

4. SEISMIC DATA ACQUISITION

4.1) Introduction.....	31
4.2) Permitting.....	32
4.3) Acquisition requirement.....	33
4.3.1) Surveying /Navigation system:.....	33
4.3.2) Energy Source:	34
4.3.3) Receivers:	38
4.3.4) Cables:	41
4.3.5) Recording System.....	41

4.4) Field Procedure	41
4.4.1) Basic Spread:	41
4.4.2) Split Spread:	42
4.5) Seismic Acquisition Parameters	44

5. SEISMIC DATA PROCESSING

5.1) Introduction:.....	45
5.2) Data Processing Steps:.....	45
5.2.1) Data reduction:	45
5.2.2) Geometric Corrections.....	47
5.2.3) Data analysis and parameter optimization.....	50
5.2.4) Data Refinement	52
5.2.5) Data Presentation and Storage.....	55

6. SEISMIC DATA INTERPRETATION

6.1) Introduction	56
6.2) Interpretation of Given Seismic Data.....	56
6.2.1) Seismic Section.....	56
6.2.2) Examining Seismic Section	58
6.2.3) Marking of Horizons.....	58
6.2.4) Interval Velocity	60
6.2.5) Average Velocity and Average Velocity Graph	60
6.2.6) Mean velocity And Mean Velocity Graph	61
6.3) Structural Analysis	61
6.3.1) Seismic Time Section	62
6.3.2) Seismic Depth Section	63
6.4) Stratigraphic Analysis	63
6.5) An Introduction of Rock Physics	65
6.6) Conclusions.....	66