TABLE OF CONTENTS

	Page
Acknowledgements	iii
Abstract	iv
List of tables	x
List of illustrations	xi
List of abbreviations	xiii
Chapter 1 Introduction	1
1.1 Study objective	2
1.2 Study scope	2
1.3 Literature review	3
Chapter 2 Processes and Procedures	5
2.1 AVO Processing	5
2.2 AVO Angle stacks	6
2.3 AVO Modeling	7
2.4 Phase correlation and phase rotation	11
2.5 Elastic impedance	13
Chapter 3 AVO processing and AVO angle stack results	14
3.1 AVO Processing results	14
3.2 AVO Angle stack results	19
Chapter 4 AVO modeling results	32
4.1 Zoeppritz-equations AVO modeling results	32
4.2 Full elastodynamic modeling results	37
4.3 Wavelet phase correlation for AVO analysis	41
Chapter 5 AVO analysis	45
5.1 AVO analysis of the surface seismic data	45
5.2 Elastic impedance for AVO analysis	49
5.3 Acoustic impedance and reflection coefficient relationship	49
5.4 P-wave and S-wave velocity relationship	53

	Page
Chapter 6 Conclusions	56
References	57
Appendix	59
Curriculum vitae	64

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Chiang Mai University

LIST OF TABLES

Table	Page
2.1 Selected parameters for the parabolic Radon-transform demultiple	8
2.2 Time-offset values for the three angle-band mute patterns	8
2.3 Velocity and density parameters of gas sands, wet sands, and coal beds used in the Zoeppritz-equations AVO modeling.	9
2.4 Main parameters used to stimulate the synthetic model	12
5.1 Real amplitude values picked from near-angle and far angle stack of line B on CDP gather number 349	48
5.2 Velocity and density parameters for bottom lithologic units	52
5.3 Vp and Vs linear-regression relationship equations for gas sands, wet sands, coal beds, and shales	53

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Chiang Mai University

LIST OF ILLUSTRATIONS

Figure		Page
2.1	Schematic map of Line A and B including Well C location and CDP number	6
2.2	The 40 Hz-Ricker wavelet that was used in the elastodynamic modeling	12
3.1	CDP gather 349 on line B before Radon demultiple but after NMO corrections and mute	15
3.2	CDP gather 349 on Line B after Radon demultiple	16
3.3	Full-fold stack section of line B without Radon demultiple	17
3.4	Full-fold stack section of line B with Radon demultiple	18
3.5	Full-fold stack section of line B without Radon demultiple, zoomed at 0.9-1.9 sec	20
3.6	Full-fold stack section of line B with Radon demultiple, zoomed at 0.9-1.9 sec	21
3.7	Near-angle (0°- 15°) band of CDP gather 349 of line B	22
3.8	Middle-angle (15°- 30°) band of CDP gather 349 of line B	23
3.9	Far-angle (30°- 45°) band of CDP gather 349 of line B	24
3.10	Near angle stack of line B	25
3.11	Middle-angle stack of line B	26
3.12	Far-angle stack of line B	27
3.13	Subtraction of near-angle stack from middle-angle stack of Line B	29
3.14	Subtraction of near-angle stack from far-angle stack of Line B	30
3.15	Subtraction of middle-angle stack from far-angle stack of Line B	31
4.1	Incident angle and reflection coefficient relationships for (a) the three gas sands and (b) the four wet sands	33

Figure (continued) **Page**

4.2 Incident angle and reflection coefficient relationships for
(a) the six coal beds and (b) all the gas sands, wet sands and coal beds 34
4.3 Reflection coefficient and incident angle relationships
computed from the four Zoeppritz equations 36
4.4 Raw synthetic CDP gather at Well-C 38
4.5 Raw synthetic CDP gather in figure 4.3 zoomed at 0.9 to 1.9 sec 39
4.6 Final processed synthetic CDP gather at Well C 40
4.7 Phase correlation of synthetic trace with real seismic trace 42
4.8 Processed CDP gather 286 of line A after phase rotation 43
4.9 Processed CDP gather 349 of line B after phase rotation 44
5.1 CDP gather 286 of line A after phase ratation showing
the seismic marker events and the three propagation angle bands 46
5.2 CDP gather 349 of line B after phase rotation showing
the seismic marker events and the three propagation angle bands 47
5.3 Real amplitude cross plot between near-offset and far-offset stack
on CDPgather number 349 of line B 48
5.4 Elastic impedance at near-angle stack (EI(10)) and
far-angle stack (EI(25)) relationship 50
5.5 Acoustic impedance (AI) and far-angle stack (EI(25))
Relationship 50
5.6 Acoustic impedance and top reflection coefficient relationship 51
5.7 Acoustic impedance and bottom reflection coefficient relationship 51
5.8 Linear-regression relationship for gas sands on Well C 54
5.9 Linear-regression relationship for wet sands on Well C 54
5.10 Linear-regression relationship for coal beds on Well C 55
5.11 Linear-regression relationship for shales on Well C 55

LIST OF ABBREVIATIONS

AI - Acoustic impedance

AVO - Amplitude variation with offset

CDP - Common depth point

EI - Elastic impedance

NMO - Normal moveout

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Chiang Mai University