## TABLE OF CONTENTS

		Pag
Acknowledge	ment	iii
Abstract		iv
List of tables		viii
List of illustra	itions	ix
List of abbrev	iations	xi
Chapter 1 In		1
1.1	Objectives and scope of the study	6
1.2	Data collection	6
Chapter 2 M	ethodology	7 7
2.1	Forward modeling stage	
	2.1.1 Generating modeled data	7
	2.1.2 Verifying the modeled data	7
2.2	Processing of modeled data	21
2.3	Processing of real data	21
Chapter 3 Re	esults and discussion	29
3.1	Processing results of modeled data	29
	3.1.1 Processing result of two-layer modeled data	29
	3.1.2 Processing result of three-layer modeled data	29
3.2	Processing results of real data	35
	3.2.1 Processing result of 2-D seismic data set 1	35
	3.2.2 Processing result of 2-D seismic data set 2	48
3.3	Discussion	66
	3.3.1 Multiple Identification	66
	3.3.2 Special condition at preparation stage and designing	66
	3.3.3 Testing of PDC parameters in common shot gather	67
	3.3.4 Mute style	67
	3.3.5 Inspection of performance of <i>PDC</i> by semblance	67
	3.3.6 Inspection of performance of <i>PDC</i> in autocorrelation	68
	3.3.7 Conventional versus new method of <i>PDC</i>	68
	3.3.8 Advantage of the new method	68
	3.3.9 Limitation of the new method	68
-	onclusions and recommendations	69
4.1	Conclusions	69
4.2	Recommendations	70
References		71
Appendix A	Forward Modeling	72
Appendix B	Convolution model of multiple	78
Appendix C	Review of predictive deconvolution	83
Appendix D	Test of mute and NMO/DNMO effect	90
Appendix E	Test of predictive deconvolution parameters	98
Curriculum v	itae	104

## LIST OF TABLE

Table		Page
1-1	Difference of interval of arrival time in millisecond of	
	multiple arrival at several offset in Figure 1-2	4
2-1	Acquisition and simulation parameters of input models	10
	Flow processing sequences of modeled data	22
2-3	Acquisition parameters of two seismic data sets in this research	23
2-4	Predictive deconvolution parameters used in this research	
	comparing with other authors	27
3-1	Comparison of processing results of seismic data set 1	49
3-2	Comparison of autocorrelation analysis of seismic data set 1	50
3-3	Comparison of processing results of seismic data set 2	. 64
3-4	Comparison of autocorrelation analysis of seismic data set 2	65

## LIST OF ILLUSTRATIONS

Figure	Page
1-1 An example of seismic stacked section containing ringy effect	•
from water reverberation and its corresponding CMP gathers	2
1-2 A modeled shot showing an unequal of interval time versus offset	3
1-3 Periodicity of multiples along radial traces	5
1-4 Concept of new technique proposed in this research	7
2-1 Methodology	9
2-2 Marine acquisition simulation of two-layer model	11
2-3 Spectral analysis of two-layer modeled shot	12
2-4 Two-layer modeled shot with its corresponding semblance analysis	13
2-5 Possibilities of seismic events predicted from two-layer input model	14
2-6 Two-layer modeled shot	15
2-7 Two-layer modeled shot overlaid by calculated shot	16
2-8 Marine acquisition simulation of three-layer model	17
2-9 Spectral analysis of three-layer modeled shot	18
2-10 Three-layer modeled shot with its corresponding semblance analysi	is 19
2-11 Three-layer modeled shot overlaid by calculated shot	20
2-12 Flow of processing sequence of 2-D seismic data set 1	25
2-13 Flow of processing sequence of 2-D seismic data set 2	26
3-1 Processing results of two-layer modeled data	
in common shot gather with their corresponding autocorrelations	30
3-2 Semblance plots of two-layer modeled shots	31
3-3 Processing results of three-layer modeled data	32
3-4 Autocorrelation analysis of three-layer model data	33
3-5 Semblance plots of three-layer modeled shots	34
3-6 Segments of shot records of data set 1	36
3-7 Semblance plots of multiple shots (data set 1)	37
3-8 Normal stacked section of data set 1 with no predictive deconvolutio	on 38
3-9 Normal stacked section of data set 1	
with conventional predictive deconvolution	39
3-10 Normal stacked section of data set 1	
with periodicity enhancement and predictive deconvolution	40
3-11 Autocorrelation of normal stacked section of data set 1	
with no predictive deconvolution	41
3-12 Autocorrelation of normal stacked section of data set 1	
with conventional predictive deconvolution	42
3-13 Autocorrelation of normal stacked section of data set 1	
with periodicity enhancement and predictive deconvolution	43
3-14 Amplitude spectrum analysis of normal stacked section	
with no predictive deconvolution (data set 1)	44
3-15 Amplitude spectrum analysis of normal stacked section	
with conventional predictive deconvolution (data set 1)	45

Figure	(continued)	Page
3-16	Amplitude spectrum analysis of normal stacked section	
	with periodicity enhancement and predictive deconvolution (data set 1)	46
3-17	F-k spectrum analysis of normal stacked sections of data set 1	47
	Segments of shot records of data set 2	51
	Semblance plots of strong multiple shot (data set 2)	52
	Normal stacked section of strong multiple data (set 2)	
	with no predictive deconvolution	54
3-21	Normal stacked section of strong multiple data (set 2)	
	with conventional predictive deconvolution	- 55
3-22	Normal stacked section of strong multiple data (set 2)	
	with periodicity enhancement and predictive deconvolution	56
3-23	Autocorrelation of normal stacked section of	
	strong multiple data (set 2) with no predictive deconvolution	57
3-24	Autocorrelation of normal stacked section of strong multiple	
	data (set 2) with conventional predictive deconvolution	58
3-25	Autocorrelation of normal stacked section of strong multiple data	
	(set 2) with periodicity enhancement and predictive deconvolution	59
3-26	Amplitude spectrum analysis of normal stacked section of strong	
	multiple data (set 2) with no predictive deconvolution	60
3-27	Amplitude spectrum analysis of normal stacked section of strong	
	multiple data (set 2) with conventional predictive deconvolution	61
3-28	Amplitude spectrum analysis of normal stacked section	
	of strong multiple data (set 2) with periodicity enhancement	
	and predictive deconvolution	62
	F-k spectrum analysis of normal stacked sections of data set 2	63
	Concept of forward and inverse modeling	74
	Basic principle of Osiris	75 
A-3	Examples of performances generated Osiris modeling software	76
	Marine acquisition simulated by Osiris involved in this research	77
	Water reverberation model	80
	Ghost model	81
C-1	Analysis of autocorrelation of input traces	0.0
~ ~	used for designing parameters of filter	88
	Predictive filtering steps in concept	89
	Test of Mute effect	92
	Overlay plot of modeled shot before and after applying mute	93
	Test of NMO/DNMO effect	94
D-4	Overlay plot of modeled shot before and after applying NMO/DNMO	95
D-5	Modeled shot before and after applied MUTE/NMO/DNMO correction	96
D-6	Overlay plot of modeled shot before and after NMO/MUTE/DNMO	
E-1	Modeled shot before and after being applied NMO correction	97
T 6	with their corresponding autocorrelation	100
	Test of autocorrelation gate (G) on modeled shot	100
	Test of operator length (n) on modeled shot	101
E-4	Test of prediction distance ( $\alpha$ ) on modeled shot	102

## LIST OF ABBREVIATIONS

2-D - Two-dimension

CDP - Common depth pointCPU - Central processing unitCSG - Common shot gather

DNMO- Differential or reverse normal moveout

FWM - Forward modeling

F-k - Frequency-wavenumber

G - Autocorrelation gate

ms - Millisecond

NMO - Normal moveout

NSTK - Normal stacked section PDC - Predictive deconvolution

QC - Qualification

s - Second

V - Velocity

 $\alpha$  - Predictive (gap) length

N - Operator length

ε - Prewhitening percentage