

**COMPARISON STUDIES ON THE EFFECTIVENESS OF
ULTRASONIC INSPECTION AND RADIOGRAPHIC INSPECTION
IN INTERNAL DEFECTS DETECTION ON WELDED JOINTS**

MAZIIDAH HAMIDI

**Final Year Project Report Submitted in
Partial Fulfillment of the Requirements for the
Degree of Bachelor of Science (Hons.) Physics
in the Faculty of Applied Science
Universiti Teknologi MARA**

MAY 2009

ACKNOWLEDGEMENTS

Praise to God for allowing me to complete this final project. First of all, I would like to give my deepest gratitude to Faculty of Applied Science (FSG), University Teknologi MARA and SIRIM Berhad for allowing me to use the facilities in order to accomplish this project. Special thanks goes to my supervisor, Dr. Syed Yusainee Syed Yahya for making it possible and guidance through out the process. Deepest thanks is dedicated to Dr. Khazali bin Hj. Mohd Zin, the Principal Consultant of JTIP, SIRIM Berhad for giving out permission to use the JTIP laboratory and for making the implementation of this project as smooth as possible. Appreciation also goes out to Mr. Jeffry Jamil, Tuan Arif Tuan Mat, and all the JTIP laboratory technicians for giving me useful knowledge and giving me guidance regarding this project.

Maziidah Hamidi

TABLE OF CONTENT

	Page
ACKNOWLEDGEMENT	iii
TABLE OF CONTENT	iv
LIST OF TABLES	vi
LIST OF FIGURES	vii
LIST OF ABBREVIATIONS	xi
ABSTRACT	xii
ABSTRAK	xiii
CHAPTER 1 INTRODUCTION	1
1.1 Background and problem statement	1
1.2 Significance of study	2
1.3 Objective of study	3
CHAPTER 2 LITERATURE REVIEW	4
2.1 Introduction	4
2.2 Welded Joints	4
2.3 The test component identification and test areas	5
2.4 The NDT inspection methods	6
2.4.1 Introduction to UT	6
2.5 UT transducers	7
2.5.1 Principles of UT inspection	8
2.5.1.1 Conventional UT	8
2.5.1.2 Advanced UT (PAUT)	9
2.5.2 UT scanning views	10
2.5.2.1 A-scan	11
2.5.2.2 C-scan	11
2.5.2.3 S-scan	12
2.5.3 The comparison between conventional UT and advanced UT	13
2.6 Radiography method	15
2.7 Advantages and disadvantages of ultrasonic and radiography method	16
2.8 Types of defects	17
2.8.1 Lack of root penetration	17
2.8.2 Lack of fusion	17
2.8.2.1 Lack of sidewall fusion	18
2.8.2.2 Lack of root fusion	18
2.8.3 Slag inclusion	19
2.8.4 Porosity	20
2.8.5 Cracks	20
2.8.6 Undercut	21
2.8.7 Excessive penetration	22
2.8.8 Concavity in the root of the weld	23

CHAPTER 3 METHODOLOGY	24
3.1 Introduction	24
3.2 Materials	24
3.3 Instruments	24
3.4 Methods	26
3.4.1 Calibration	27
3.4.2 Beam profile	30
3.5 Conventional UT inspection method	32
3.6 Advanced UT inspection method	33
3.7 Radiographic inspection method	34
3.8 Differentiation process	35
CHAPTER 4 RESULTS AND DISCUSSIONS	36
4.1 Introduction	36
4.2 The differenced between UT inspections and radiographic inspection	36
4.3 Inspection results	37
4.3.1 Single V welds	37
4.3.1.1 SV-01	38
4.3.1.2 SV 02	42
4.3.1.3 SV-03	44
4.3.2 Double V welds	50
4.3.2.1 DV-017	51
4.3.2.2 DV-05	55
4.4 Number of defects detected	59
4.5 The sizing of defects	59
CHAPTER 5 CONCLUSION AND RECOMMENDATION	60
CITED REFERENCES	61
CURRICULUM VITAE	63

ABSTRACT

COMPARISON STUDIES ON THE EFFECTIVENESS OF ULTRASONIC INSPECTION AND RADIOGRAPHIC INSPECTION IN INTERNAL DEFECTS DETECTION ON WELDED

The purpose of this project is to investigate the effectiveness of ultrasonic and radiographic method. The effectiveness is measured from the ability of each methods and techniques used to detect internal defects in seven steel welded joints inspected. All three single Vs, two double Vs and two curved joints go through two Non-Destructive Testing methods, the ultrasonic and radiographic method. For ultrasonic method, both conventional ultrasonic and advanced ultrasonic, called the phased array, are used. The difference between these techniques is the type of transducers and instrument used. This makes them different through the ability of detection. Radiographic method uses gamma ray in the radiation process on test specimens and scanned using Computerized Radiography technique. Results obtained for both inspection methods is compared to find out the difference of effectiveness.