



FABRICATION OF EDDY CURRENT PROBE FOR SS 304 TUBE INSPECTION

FAIRUS DORA BT. ABDUL MALEK

(2000127546)

**A thesis submitted in partial fulfillment of the requirements for the award
of Bachelor Engineering (Hons) (Mechanical)**

**Faculty of Mechanical Engineering
Universiti Teknologi MARA (UiTM)**

OCTOBER 2004

ACKNOWLEDGEMENT

First and foremost, Alhamdulillah and thanks to Allah the Almighty for the completion of this Final Project on Fabrication of Eddy Current probe report as part of the requirement for the award of Degree in Mechanical Engineering.

Secondly, we would like to thank our supervisor and co-supervisors Prof. Madya Noraini Wahab, Dr. Abdul Razak Hamzah and Mr. Ilham Mukriz Zainal Abidin for their help and effort in guiding us to complete the final project. Their endless effort and work has certainly given us the moral boost in completing the project in such a hectic schedule.

Our thanks extends to all the staff in Malaysia Institute of Nuclear Technology (MINT) especially to Mr. Shuaib Ibrahim. Without them we certainly will not finish the project on time. They have been grateful enough to grant us their time and place for doing all the experiment despite of their daily works and deadlines. They have shown us the professionalism by co-operating and sharing their expertise in eddy current testing especially in tube testing for the completion of this project. In addition, the supplement of the vital information meant greatly in the completion of this project.

Last but not least, our thanks goes to our family that had supported us in term of financial support and also thanks to all the staff, lecturers and colleagues for sharing with us the valuable information about this project and those people who help us directly and indirectly in the completion of this report.

ABSTRACT

The final year student of UiTM Mechanical Engineering under supervision of Prof. Madya Noraini Wahab has carried out this project of "Fabrication of Eddy Current Probe For SS 304 Tube Inspection".

The important part about this project is to study some basic theory that involve in eddy current testing. As we know, eddy current testing is one of the major Non-Destructive methods for tube testing. It used a localized electrical field that is introduced into a conductive test specimen by electromagnetic induction. Virtually all-conductive materials can be examined for flaws, metallurgical conditions, thinning and conductivity. The technique is quick, versatile, and sensitive, can be non-contacting and is easily adaptable to automation and in site examination.

The main purpose of this final year project is to fabricate eddy current probe using parameters obtained from governing equation by choosing the best eddy current signal with the respect to number of coil winding that can be used for testing defects in SS 304 tube.

There are numbers of research methodology used in order to complete the project. The very first step is the literature review studies to understand the basic principals of eddy current Non-Destructive testing. The next step is experimental method used to fabricate and analyzed the best eddy current signal from a set of probe that have been fabricated in the laboratory. Prior to the experiment, 4 eddy current probes are fabricated, each having 40,50,60 and 70 numbers of coil turns. All of these probes are differential type of probe.

TABLE OF CONTENTS

CONTENTS	PAGE
PAGE TITLE	i
ACKNOWLEDGEMENT	ii
ABSTRACT	iii
TABLE OF CONTENTS	v
LIST OF TABLE	ix
LIST OF FIGURES	x
LIST OF ABBREVIATIONS	xii
CHAPTER 1 INTRODUCTION	
1.1 Introduction of Non-Destructive Testing	1
1.2 Objective of the project	2
1.3 Significance of the project	2
CHAPTER 2 EDDY CURRENT TESTING AND APPLICATION IN NON-DESTRUCTIVE TESTING	
2.1 Eddy current testing	5
2.2 Historical perspective of eddy current testing	7
2.3 Basic equipment	8
2.4 Electromagnetic Induction	9
2.5 Eddy Current flow characteristics	14
2.6 Factors affecting eddy current response	16

CHAPTER 1 ,

INTRODUCTION

1.1 Introduction of Non-Destructive Testing

Non-destructive testing is a descriptive term used for the examination of materials and components in such a way that allows materials to be examined without changing or destroying their usefulness. Every item or large portion of the test can be used after examined with no adverse consequences. The materials can be tested for its conditions at internal parts and at the surface and this can be done while it is operating. Most of the Non-destructive testing method are portable and can be easily taken to the object that to be examined.

Non-destructive testing is a quality assurance management tool that can give impressive results when used correctly. It requires an understanding of the various methods available, their capabilities and limitation, knowledge of the relevant standards and specifications for performing the tests. Before performing the test, the orientation discontinuities must be considered to ensure that it is detectable. While most methods are cost effective, some, such as radiography can be very expensive.

There are numbers of Non-destructive testing methods other than eddy current testing applied in the industrial fields today and the most common methods are the liquid penetrant, magnetic particle inspection, ultrasonic inspection and radiographic inspection as summarizes in Table 1.1.