CRACK DETERMINATION BY CRACK TIP DIFFRACTION TECHNIQUE

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Submitted in partial fulfilment of the requirements for

the Bachelor of Science (Hons.) in Applied Chemistry

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Shah Alam

October 2000

ABSTRACT

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The objective of this thesis is to investigate on a new technique of ultrasonic for measuring height of crack which is perpendicular and obliquely to the surface. Crack tip diffraction technique is used and it is the best method with regard to accurate sizing. This method differs from traditional pulse echo technique in that because it monitor diffracted signal at the edges of defect hence the position and size of defect can be measured accurately.

This experiment was carried out by using three different types of probe angle that are 45°,60° and 70°. The specimen have different positions of crack within the component, at the surface and at the bottom of the specimen. The length and the width of steel specimen are 150 mm and 25 mm respectively. The specimen were fabricate with different length of crack from 1 mm until 12 mm to in order to find the accuracy of this technique.

From this experiment, probe angle of 60° is the best probe to for this technique due to it capabilities to detect crack in both position. During this experiment the instrument sensitivity (gain) need to set at high level, if not the no diffracted echo would display in the CRT screen. In practise, diffracted echoes at crack tip are not so clear, so it need experience personal to distinguish the relevant echoes.

For sizing crack location at the bottom, the experimental value are close to the actual value and for sizing crack location at the surface the result shows that when size of a crack below than 5 mm the accurate reading cannot be obtained, it may be due to beam spread.

ACKNOWLEDGEMENTS

First and foremost I wish to thank the Almighty God for giving me the inner strength and good health throughout completing this project paper. I would like to convey my heartiest gratitude to my supervisor, Puan Norazah Abdul Rahman for her time, patience, encouragement and professional guidance towards the completion of this paper.

Special thank to the Dr. Pauzi Ismail, for his helpful and co-operation and also thank to all staff in MINT and SIRIM SDN. BHD. for their assistance and companion.

Finally, I wish to expresses my deepest appreciation to those who have contributed in some way to carry out this project successfully.

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CHAPTER 1

INTRODUCTION

Cracks are very hazardous flaws with regard to the loading capability of a material. If we look at this from a mechanical fracture point of view we see that the crack's depth propagation is more decisive than its length although, unfortunately, it is mostly the crack length which can be more accurately described by nondestructive methods than the crack depth propagation. Therefore, efforts made to improve the information accuracy of the nondestructive method are correspondingly great.

Nondestructive testing (NDT) is the examination of an object with technology that does not affect the object's future usefulness. NDT provides an excellent balance between quality control and cost-effectiveness.

The term "NDT" includes many methods that can:

- detect internal or external imperfections
- determine structure, compostion, or material properties
- measure geometric characteristics

NDT should be used in all phases of a product's design and manufacture, including materials selection, research and development, assembly, quality control, and maintenance.