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ACOUSTIC EMISSION CHARACTERIZATION OF PITTING CORROSION IN  
CRUDE OIL STORAGE TANK

By

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Research Report submitted in partial fulfillment of  
the requirement for degree of  
Bachelor of Applied Sciences (Physics Electronics and Instrumentations)

Department of Physical Sciences  
Faculty of Sciences and Technology  
UNIVERSITI MALAYSIA TERENGGANU  
2007

1100051281



**PENGAKUAN DAN PENGESAHAN LAPORAN  
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Adalah ini diakui dan disahkan bahawa laporan penyelidikan bertajuk:

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## ACKNOWLEDMENT

First of all I would like to thank **Allah S. W. T** for the blessing and the mighty strength given for me to finish my research. Besides gaining the knowledge, many of the things I learn which is useful for my future.

I wish to express my gratitude to my supervisor **Mr Azhar Bin Mohd Sinin** for the attention given for me. Thank you for the co-operation, commitment and helpness given as long as I run this research.

A millions thanks I dedicated to my co supervisor **Mr Shukri Bin Mohd** for his neat guide along the experiment done. His advice, opinions, encouragement and motivation make me strong to do this research until the end. Thank you sir for introduce me to the world name “acoustic emission”.

I am also gratitude to all lecturers and staff in Department of Physical Sciences, especially **Assoc. Professor Dr. Senin Bin Hassan** and **Mr. Mohd Razman Bin Ngah**. And also thank you to **Malaysian Institute for Nuclear Technology Research (MINT)**, Bangi.

Beside that, I am also grateful to my father and mother, **Mr. Ahmad Latif Bin Muhamad Kadri & Puan Rokiah Aziz**. Thank for the moral support given. And for my family member’s **Kak yong, Hawa, Husna** and **Jenny** thank you for understanding my situation. A very special thank for my best friend, **Mr Mohd Azlan Bin Harun**. Thank for being around when I am needed. Your support was my inspiration.

My sincere gratitude is also convey to my colleagues **Nurmysita Binti Mohamed Mokhtar, Miss Siti Aishah Bt Abdullah, Miss Nor Baiyyah Binti Mohd Nor Saidi, Ina, Yuyun, Ayus, Abang Amin, Kak Faris, Shahrul** and **Shahir**. Thank you very much! And for those person who participates direct or indirectly in finishing my research.

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*26 April 2007*



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## **LIST OF ABBREVIATIONS/ SYMBOLS**

AE	Acoustic emission
ASTM	American Society for Testing and Material
DiSP	Digital Signal Processing
dB	Decibel
EMF	Electric and magnetic field
Fe	Ferum
H <sub>2</sub>	Hydrogen
LAY	Layout
SCE	Saturated Calomel Electrode
UMT	Universiti Malaysia Terengganu
3-D	3 Dimension

**LIST OF APPENDIX**

**Appendix**

AEwin Windows Real Times Software

**ABSTRACT**

The purpose of this study is to prove that acoustic emission is the non destructive test, which useful to detect the pitting corrosion in the crude oil storage tank. However, the electrochemical analysis is done to study the corrosion rate in the crude oil of various places. The crude oil is from Dulang, Bintulu, Miri Light, Tapis and Labuan. The electrochemical study has show that the corrosion rate of ASTM 516 grade 70 exposed to each various locations of crude oil was very low. Therefore, it can be concluded that there is no significant effect of crude oil to the surface of ASTM 516 grade 70 steel as long as if there is no constituent aggressive anion present in crude oils. Simulation technique is done to prove that the acoustic emission able to detect the signal from pitting corrosion. This is done by applying the low voltage and low current on the specimen. Meanwhile, for the comparison between the acoustic emission signal and noise is done to identified and differentiate the amplitude range between them.

**ABSTRAK**

Kajian ini dijalankan adalah untuk membuktikan bahawa pancaran akustik merupakan satu kaedah termaju tanpa musnah yang mampu mengesan lekuk pengaratan. Walaubagaimanapun, analisis elektrokimia dijalankan untuk mengkaji kadar pengaratan yang terjadi dari sampel minyak mintah. Minyak mintah ini diperolehi dari Dulang, Bintulu, Miri Light, Tapis dan Labuan. Hasil daripada analisis elektrokimia menunjukkan bahawa kadar pengaratan ke atas specimen ASTM 516 gred 70 adalah sangat rendah. Oleh kerana itu, adalah disimpulkan bahawa tiada kesan kesinambungan oleh minyak mentah terhadap permukaan spesimen. Ini berlaku kerana tiadanya unsur agresif anion yang wujud di dalam minyak mentah. Manakala bagi membuktikan bahawa pancaran akustik mampu mengesan lekuk pengaratan, satu teknik simulasi dijalankan. Ini adalah dengan membekalkan voltan dan arus dalam jumlah yang terlalu kecil di atas permukaan spesimen. Selain itu, bagi membezakan isyarat di antara lekuk pengaratan dan hingar dari persekitaran, penelitian terhadap julat amplitud dilakukan.