CORROSION BEHAVIOUR OF ZINC COATED STEEL IN SEAWATER

NURUL ASYIKIN BINTI ISHAK

FACULTY OF MARITIME STUDIES AND MARINE SCIENCE
UNIVERSITI MALAYSIA TERENGGANU

2012

CORROSION BEHAVIOUR OF ZINC COATED STEEL IN SEAWATER.

BY

NURUL ASYIKIN BINTI ISHAK
UK17615

A THESIS SUBMITTED IN PARTIAL FULFILMENT OF
THE REQUIREMENTS FOR THE AWARD OF THE DEGREE OF
BACHELOR OF APPLIED SCIENCE (MARITIME TECHNOLOGY)

DEPARTMENT OF MARITIME TECHNOLOGY
FACULTY OF MARITIME STUDY AND MARINE SCIENCE
UNIVERSITY MALAYSIA TERENGGANU
(UMT)
2012

DEPARTMENT OF MARITIME TECHNOLOGY
FACULTY OF MARITIME STUDIES AND MARINE SCIENCE

DECLARATION AND VERIFICATION REPORT

FINAL YEAR RESEARCH PROJECT

It is hereby declared and verified that this research report entitled: **CORROSION BEHAVIOUR OF ZINC COAETD STEEL IN SEAWATER** by **NURUL ASYIKIN BINTI ISHAK**, Matric No. **UK 17615** has been examined and all errors identified have been corrected. This report is submitted to the Department of Maritime Technology as partial fulfillment towards obtaining the Degree of **BACHELOR OF APPLIED SCIENCE (MARITIME TECHNOLOGY)**, Faculty of Maritime Studies and Marine Science, Universiti Malaysia Terengganu.

Verified by:

.....

Principal Supervisor

Name: **IR. FERRY MANUHUTU**

Date: 21/06/2012

Official stamp:

FERRY MANUHUTU
JABATAN TEKNOLOGI MARITIM
FAKULTI PENGAJIAN MARITIM DAN SAINS MARIN
UNIVERSITI MALAYSIA TERENGGANU (UMT)
21030 KUALA TERENGGANU

.....

Second Supervisor (where applicable)

Name: **PROF. MADYA DR. WAN NORSANI BIN WAN NIK**

Date: 25/6/12

Official stamp:

PROF. MADYA DR.WAN MOHD NORSANI WAN NIK
DEKAN
FAKULTI PENGAJIAN MARITIM DAN SAINS MARIN
UNIVERSITI MALAYSIA TERENGGANU (UMT)

.....

Head of Department of Maritime Technology

Name: **PROF. MADYA DR. MOHAMMAD FADHLI BIN AHMAD**

Date: 21/6/12

Official stamp:

ASSOC.PROF. DR. MOHAMMAD FADHLI AHMAD
HEAD
DEPARTMENT OF MARITIME TECHNOLOGY
FACULTY OF MARITIME STUDIES AND MARINE SCIENCE
UNIVERSITI MALAYSIA TERENGGANU (UMT)
21030 KUALA TERENGGANU

DECLARATION

I hereby declare that this thesis entitled **CORROSION BEHAVIOUR OF ZINC COATED STEEL IN SEAWATER** is the result of my own research except as cited in the references.

Signature	:	.....
Name	:	NURUL ASYIKIN BINTI ISHAK
Matrix No	:	UK 17615
Date	:	31 MAY 2012

This project report should be cited as :

N. Asyikin 2012. Corrosion Behaviors Of Zinc Coated Steel In Seawater. Undergraduate thesis, Bachelor of Applied Science (Maritime Technology), Faculty of Maritime Studies and Science Marine, Universiti Malaysia Terengganu, Terengganu. 46p.

ACKNOWLEDGEMENT

At the end of my thesis, I would like to thank to Allah S.W.T and all of those people who made this thesis possible and enjoyable experience for me.

First of all I want to say Alhamdulillah and thank to Allah because of the chances, I manage to finish my thesis.

I would like to express my sincere gratitude neither to my supervisor, Mr. Ir. Ferry Manuhutu and my second supervisor, Prof. Madya Dr. Wan Norsani Bin Wan Nik on their guidance and inducement that they gave me along the time given to complete my thesis Corrosion Behaviour of Zinc Coated Steel in Seawater. I would like to give my appreciation to Research Assistant, Mr. Fakhratul Ridwan Bin Zulkifli, Maritime Technology's staff, Marine Science' staff, Physics Department's staff and INOS's staff which giving the permission to use their laboratory and facilities.

I would like to express my deepest gratitude for the constant support, emotional understanding and love that I received from my family and Mr. Ahmad Najmi Bin Abd Rohim. Lastly, I would like to thank to all my friend and course mate who always supporting and inspired me to finish my thesis directly or indirectly.

Thank you.

CORROSION BEHAVIOUR OF ZINC COATED STEEL IN SEAWATER

ABSTRACT

This study investigated the performance of zinc coating as corrosion prevention for mild steel. Mild steel is the most versatile, least expensive and widely used but it is easily corrode when expose to aggressive environment like seawater. The objectives of this study are to know the effect of zinc coating towards rate of corrosion of mild steel in seawater and the effect of zinc coating toward corrosion of steel. In this review, reports the results of weight loss analysis, impedance analysis, morphology and surface analysis and lastly, the rate of corrosion of sample. The samples used in this study were fully zinc coated steel, zinc coated steel with scratch and mild steel as a control. The metals were immersed in seawater at room temperature for 40 days with 10 days time intervals of characterization test. The results show that the corrosion rate of fully zinc coated steel decrease with time exposure from 0.03 mm/y to 0.01 mm/y and for zinc coated steel with scratch, from 0.034 mm/y to 0.012 mm/y. Furthermore, the result obtained from the impedance analysis, the resistance of samples increase with the time exposure. The findings reveal that the minimal rise in weight for fully zinc coated steel and zinc coated steel with scratch. Lastly, the results obtained lead to the conclusion that zinc coating is effective as corrosion protection for steel even with a presence of cut edge or scratch.

CORROSION BEHAVIOUR OF ZINC COATED STEEL IN SEAWATER

ABSTRAK

Kajian ini menyiasat tentang keupayaan salutan zinc sebagai pencegahan kakisan keluli lembut. Keluli lembut adalah yang paling versatile, kurang mahal dan digunakan secara meluas tetapi ia mudah menghakis apabila terdedah kepada persekitaran yang agresif seperti air laut. Objectik kajian ini adalah untuk mengetahui kesan salutan zinc terhadap kadar kakisan keluli lembut dalam air laut dan kesan daripada salutan zinc terhadap pengaratan keluli lembut. Dalam kajian ini melaporkan keputusan penurunan berat, analisis impedans, morfologi dan analisis permukaan dan akhir sekali, kadar kakisan sampel. Sample yang digunakan dalam kajian ini adalah keluli bersalut sepenuhnya dengan zinc, keluli bersalut zinc dengan gores dipermukaannya, dan keluli lembut sebagai kawalan. Logam direndam didalam air laut pada suhu bilik selama 40 hari dan dengan 10 hari selang masa ujuan pencirian. Keputusan menunjukkan bahawa kadar kakisan keluli bersalut zinc sepenuhnya berkurang daripada 0.03 mm/y kepada 0.01 mm.y dan keluli bersalut zinc dengan gores dari 0.034 mm/y kepada 0.012 mm/y. tambahan pula, keputusan yang diperolehi daripada analisis impedans, rintangan sampel meningkat dengan masa rendaman sampel. Kajian ini menunjukkan kenaikan minimum berat untuk keluli bersalut zinc sepenuhnya dan keluli bersalut zinc dengan gores. Akhir sekali, keputusan yang diperolehi membawa kepada kesimpulan bahawa salutan zinc adalah berkesan sebagai perlindungan kepada kakisan keluli walaupun dengan kehadiran gores atau calar.