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**Study of Corrosion in Crude Oil Storage Tanks of Marsa  
Bashayer II -Sudan**

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**ABSTRACT**

The aim of this study is to determine the impact of corrosion on the

crude oil storage units used by Petrodar Company and to investigate the causes of internal and external corrosion of low carbon steel which used in above-ground crude oil storage tanks that may lead to leakages, pollution, disasters and potential impacts.

The Low carbon steel was tested in liquid medium crude oil, crude oil and seawater mixture 1:1. The results were found that corrosion on low carbon steel but slowly at an annual rate (0.3125 mm / y) and (0.3250 mm / y) respectively.

The weight loss for low carbon steel in crude oil, crude oil and seawater mixture were tested, the average weight loss of the low carbon steel was found to be (3.0 mg) in 456 hours.

The tests also included the measurement of the pH value in the presence of low carbon steel in both crude oil and mixture of crude oil and seawater the results were found (6.10 - 6.85) and (5.27 - 6.36) respectively.

The Chemical Analysis result of crude oil sample show 4.20 mg /g total acid content (TAN) which concenter to be very high content

## ملخص الدراسة

هدفت هذه الدراسة لتحديد أثر التآكل على وحدات تخزين النفط الخام التي تستخدمها شركة بترودار. ونسبه لمخاطر التآكل الداخلي والخارجي للصلب منخفض الكربون المستخدم في خزانات النفط الخام فوق الأرض مما يؤدي إلى كوارث محتملة من تسرب وتلوثات بالنفط, حيث تم إجراء تجارب التآكل على معدن الصلب منخفض الكربون في وسط سائل من النفط الخام ومزيج من النفط الخام ومياه البحر ودلت النتائج على وجود تآكل على الصلب منخفض الكربون لكن ببطء ، أي بمعدل سنوي مقداره (0.3250mm/y) و (0.3125mm/y) لكل منهما على التوالي.

كما اجريت تجارب قياس فقدان الوزن للصلب منخفض الكربون في كلا الوسطين النفط الخام ومزيج النفط الخام ومياه البحر حيث وجد إن متوسط الوزن المفقود للصلب الكربوني (3.0 mg) في كل منهما خلال (456 ساعة).

كما شملت التجارب قياس الرقم الهيدروجيني للوسط أثناء وجود الصلب منخفض الكربون في كل من النفط الخام ومزيج النفط الخام ومياه البحر حيث وجد ان النتائج (6.10- 6.85) و (5.27- 6.36) لكل منهما على التوالي. كما تم التحليل الكيميائي لعينه من النفط الخام حيث وجد أن نسبة الأحماض الكلية عالية جدا ( 4.2 ملج/جم ) .

## Table of Content

<a href="#">Dedication</a> .....	<a href="#">iii</a>
<a href="#">Acknowledgments</a> .....	<a href="#">iv</a>
<a href="#">ABSTRACT</a> .....	<a href="#">v</a>
ملخص الدراسة .....	<a href="#">v</a>
<a href="#">Table of Content</a> .....	<a href="#">vii</a>
<a href="#">List of Figures</a> .....	<a href="#">x</a>
<a href="#">List of Tables</a> .....	<a href="#">xi</a>
<a href="#">Abbreviations</a> .....	<a href="#">xii</a>

### CHAPTER ONE INTRODUCTION

1.0 Introduction .....	1
<a href="#">1.1 Marsa bashayer 2 Marine Terminal</a> .....	<a href="#">4</a>
<a href="#">1.1.2 Main Process Systems</a> .....	<a href="#">4</a>
<a href="#">1.1.3 Supporting Systems</a> .....	<a href="#">5</a>
<a href="#">1.1.4 Crude Inlet &amp; Storage tanks</a> .....	<a href="#">5</a>
<a href="#">1.1.5 Crude Export &amp; Metering</a> .....	<a href="#">6</a>
<a href="#">1.2 Problem Statement</a> .....	<a href="#">8</a>
<a href="#">1.3 Study Objectives</a> .....	<a href="#">8</a>
<a href="#">1.4 Scope of the Study</a> .....	<a href="#">9</a>

### CHAPTER TWO LITERATURE REVIEW

<a href="#">2.1 Previous Studies</a> .....	<a href="#">10</a>
<a href="#">2.2 Corrosion Mechanism</a> .....	<a href="#">12</a>
<a href="#">2.3 Corrosion Reactions</a> .....	<a href="#">12</a>

2.3.1	<a href="#">Chemical reaction of corrosion</a>	12
2.3.2	<a href="#">Electrochemical Corrosion Reactions</a>	13
2.4	<a href="#">Corrosion Mechanisms of Steel</a>	17
2.5	<a href="#">Forms of Corrosion</a>	19
2.5.1	<a href="#">General or Uniform Corrosion</a>	19
2.5.2	<a href="#">Localized Corrosion</a>	20
2.5.2.1	<a href="#">Stress Corrosion Cracking</a>	20
2.5.2.2	<a href="#">Pitting Corrosion</a>	20
2.5.2.3	<a href="#">Galvanic Corrosion</a>	21
2.5.2.4	<a href="#">Crevice Corrosion</a>	21
2.6	<a href="#">Corrosion Protection and Monitoring</a>	21
2.6.1	<a href="#">Coatings</a>	22
2.6.1.1	<a href="#">Organic Coatings</a>	22
2.6.1.2	<a href="#">Inorganic and metallic coatings</a>	22
2.6.2	<a href="#">Cathodic and Anodic Protection</a>	23
2.6.3	<a href="#">Corrosion monitoring and measurement</a>	24
2.7	<a href="#">Corrosion Rate Determination</a>	25
2.7.1	<a href="#">Weight Loss Measurement</a>	25
2.7.2	<a href="#">Linear Polarization Resistance (LPR) Technique</a>	25
2.8	<a href="#">Crude Oil</a>	26
2.9	<a href="#">Red Sea Water</a>	26
2.9.1	<a href="#">Effect of pH</a>	26

## **CHAPTER THREE [MATERIALS AND METHODS](#)**

3.1	Materials .....	27
3.1.1	<u>Carbon Steel .....</u>	<u>28</u>
3.1.1.1	<u>Chemical Analysis .....</u>	<u>28</u>
3.1.2	<u>Carbon Steel Preparation .....</u>	<u>28</u>
3.1.2.1	<u>Grinding .....</u>	<u>28</u>
3.1.3	<u>Corrosive Media .....</u>	<u>28</u>
3.1.3.1	<u>Crude Oil .....</u>	<u>28</u>
3.1.3.2	<u>The composition of sea water.....</u>	<u>29</u>
3.2	<u>Samples Preparation for Experiment .....</u>	<u>30</u>
3.3	<u>Method .....</u>	<u>30</u>
3.3.1	<u>Weight Loss Measurement .....</u>	<u>30</u>
3.3.2	<u>Corrosion Rate Determination .....</u>	<u>31</u>
3.3.3	<u>pH Measurement .....</u>	<u>31</u>
<b>CHAPTER FOUR      <u>RESULTS AND DISCUSSION</u></b>		
4.1	<u>Weight Loss Measurement and Corrosion Rate .....</u>	<u>32</u>
4.2	<u>pH measurement .....</u>	<u>34</u>
<b>CHAPTER FIVE      <u>CONCLUSION AND RECOMMENDATIONS</u></b>		
5.1	<u>Conclusion .....</u>	<u>37</u>
5.2	<u>Recommendations.....</u>	<u>38</u>
	<u>REFERENCES .....</u>	<u>39</u>

## List of Figures

<a href="#"><u>Figure 1 MT Crude Inlet &amp; Storage tanks</u></a> .....	7
Figure 2 Plot of weight loss VS time using OriginPro .....	39
Figure 3 pH versus time for samples 1 and .....	43
Figure 4 Image shows formation of water .....	44

## List of Tables

<a href="#">Table 3.1 Chemical Analysis of low carbon steel.....</a>	<a href="#">27</a>
<a href="#">Table 3.2 Red Sea Major Salt Water chemical analyses.....</a>	<a href="#">29</a>
<a href="#">Table 4.1 Weight loss measurement for the coupons with their respective media....</a>	<a href="#">32</a>
<a href="#">Table 4.2 pH of solutions containing samples 1 in Crude Oil and 3 in Composite... </a>	<a href="#">34</a>
<a href="#">Table 4.3 Chemical analyses of Dar Crude Oil.....</a>	<a href="#">36</a>



## Abbreviations

Bashayer Marine Export Terminal	B.M.T
Barrel per Day	bbd
Catenary Anchor Leg Mooring	CALM
American Society of Testing and Materials	ASTM
Energy Dispersive Spectroscopy	EDS
Density [ $\text{kg}/\text{m}^3$ ]	$\tilde{n}$
Diameter [ <i>meter</i> ]	D
Hazardous Materials	HAZMAT
Pipeline End-Manifold	PLEM
Petrodar Operating Company	PDOC
Total Acid Number	TAN
Aboveground Storage Tanks	ASTs

## 5.1 Conclusion

To conclude, the low carbon steel corroded at a very low and acceptable rate in crude oil and composite of Crude oil and Sea Water due to the noncorrosive nature of the organic hydrocarbons in crude oil and composite of Crude oil and Sea Water. The behavior of the steel based on its microstructure experienced corrosion first at selective regions which were at areas having the ferrite phase due to its susceptibility to corrosion. A form of reaction between carboxylic acid in the crude oil and composite of Crude oil and Sea Water with the metal contributed to the corrosion of the low carbon steel. When the metals corroded, they experienced weight loss. The dissolution of metallic ions contributed to the corrosion reactions, thus, reducing the pH of the two by evolution of hydrogen ions. After the samples were removed, the pH started to increase due to the introduction of oxygen and neutralization reaction occurring forming water. From these results a simple and cheap method of inspection for corrosion can be designed.

## **5.2 Recommendations**

I recommend that this experiment be carried out for hours more 456 hours and temperature included as a variable to examine the effect of temperature. Additional analysis should be done, such as analysis of the surface using EDS. In addition to pH, crude oil and tank drain water composition should be analyzed as the experiment goes on. The pilling Bed worth ratio can also be used in addition to corrosion rate to tell us more about the ratio between the scales formed and the corroded metal for further knowledge on the scales formed.