

**MITIGATION OF AMMONIUM CHLORIDE CORROSION ON CARBON STEEL IN
REFINING UNIT**

BY

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17PCM01712

July, 2019

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**A DISSERTATION SUBMITTED TO THE SCHOOL OF POSTGRADUATE STUDIES
IN PARTIAL FULFILMENT FOR THE AWARD OF MASTERS OF ENGINEERING
(M.Eng) IN MECHANICAL ENGINEERING IN THE DEPARTMENT OF
MECHANICAL ENGINEERING , COLLEGE OF ENGINEERING, COVENANT
UNIVERISTY, OTA**

July, 2019

ACCEPTANCE

This is to attest that this is accepted in partial fulfillment of the requirements for the award of the degree of Masters of Engineering in Mechanical Engineering in the department of Mechanical Engineering, College of engineering, Covenant University, Ota.

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signature and date

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Dean, school of Postgraduate Studies

signature and date

DECLARATION

I, AKPANYUNG KINGSLEY VICTOR (17PCM01712) declare that this research work was carried out by me under the supervision of Prof. R. T. Loto of the department of Mechanical Engineering, Covenant University, Ota, Nigeria. I attest that this dissertation has not been presented either wholly or partially for the award of any degree elsewhere. All source of data, scholarly information used in this are duly acknowledged.

AKPANYUNG, KINGSLEY VICTOR

Signature and date

CERTIFICATION

We certify that the dissertation titled “Mitigation of Ammonium Chloride Corrosion on Carbon Steel in Refining Unit” is an original work carried out by Akpanyung, Kingsley Victor (17PCM01712), in the Department of Mechanical Engineering, College of Engineering, Covenant University, Ota, Ogun State, Nigeria, under the supervision of Prof. Roland T. Loto. We have examined and found the work acceptable for the award of a Masters in Engineering in Mechanical Engineering.

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DEDICATION

I am dedicating this research work to God Almighty for bringing me this far. None of my input in this work was without him. To him alone be all the glory.

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ABSTRACT

Ammonium chloride corrosion produces localized destructive form of corrosion posing devastating threat to refining equipment integrity and safety of refinery process. Ammonium chloride forms an underdeposit corrosion mostly experienced in the overhead equipment and piping for crude and hydroprocessing units causing severe fouling and damages that posed negative impact on the operating reliability of various processing units. This work addresses the corrosion mechanism caused by ammonium chloride and its inhibition against Hydrochloric acid using Carbon steel. Weight loss analysis and polarization was used to study the inhibition efficiency and corrosion rate of the samples in 0.5M HCl, 1.0M HCl, 20% NH₄Cl and 30% NH₄Cl solution. The average inhibition efficiency and corrosion rate for 0mL, 2mL, 4mL, 6mL, 8mL, and 10mL of Neem Oil in 0.5M HCl, 1.0M HCl, 20% NH₄Cl, and 30% NH₄Cl solutions were determined. Result showed that Neem Oil Extract was effective in both HCl and NH₄Cl solution on Carbon steel. Inhibition efficiency of each samples increases with Neem Oil concentration while the corrosion rate decreases with concentration.