



UNIVERSITI
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PETRONAS

MECHANISM OF FORMATION DAMAGE USING ALKALINE FLOODING

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Under the Supervision of

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Dissertation submitted to the Petroleum Engineering Programme
in Partial Fulfilment of the Requirements
for the Bachelor of Engineering (Hons) Degree
in Petroleum Engineering

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CERTIFICATION OF APPROVAL

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Approved by,

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UNIVERSITI TEKNOLOGI PETRONAS

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CERTIFICATION OF ORIGINALITY

This is to certify that I am responsible for the work submitted in this project, that the original work is my own except as specified in the references and acknowledgement, and that the original work contained herein have not been undertaken or done by unspecified sources or persons.

NUR AZLIZA BINTI MOHD FUZI

ABSTRACT

Alkaline flooding, also known as caustic flooding, is the process of injecting alkaline into the reservoir in order to enhanced oil recovery. Even though it has the ability to increase production, using alkali would also mean a greater reactivity with the reservoir rocks which could also lead to damaging effects on the permeability. Hence, in order to investigate the extent of the formation damage, experiments will be conducted. The experiments will be done using core flooding and the permeability obtained from it are interpreted and discussed. This experiment will not just focus on the permeability but also the visualization of any form of particles migration and plugging which leads to permeability reduction by using the Scanning Electron Microscopy (SEM). In addition, software will be used in order to determine the skin for alkaline flooding and will be compared to the experimental value. Hence, this will provide a possible way for estimating the formation damage in alkaline flooding. In this report, a literature review is done on the general understanding of alkaline flooding, formation damage and how both are related. This investigation is important in order to be able to see how much damage alkaline flooding can cause to the formation which will then help to identify any mitigation and benefits of its uses in the field.

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TABLE OF CONTENTS

CERTIFICATION	ii
ABSTRACT	iv
ACKNOWLEDGEMENT	v
TABLE OF CONTENT	vi
LIST OF FIGURES	viii
LIST OF TABLES	ix
ABBREVIATION & NOMENCLATURE	x
CHAPTER 1 INTRODUCTION	
1.1 Background of Study	1
1.2 Problem Statement	3
1.3 Objectives	3
1.4 Scope of Study	3
1.5 Relevancy of the Project	4
1.6 Feasibility of the Project	4
CHAPTER 2 LITERATURE REVIEW	
2.1 Alkaline Flooding and its Mechanism	5
2.2 Alkali Fluid Interaction with Crude oil and Rock	6
2.3 Factors That Affect Alkaline Flooding	8
2.4 Effects of Using Different Alkaline	9
2.5 Formation Damage Determination	9
2.6 Visualization Methods	11
CHAPTER 3 METHODOLOGY	
3.1 Research Methodology	13
3.2 Key Milestone and Project Activities Gantt Chart	14
3.3 Experimental Methodology	

3.3.1	Compatibility Test	16
3.3.2	Core Cleaning	16
3.3.3	Porosity and Permeability Determination	17
3.3.4	Core Saturation	18
3.3.5	Core Flooding	19
3.3.6	Field Emission Scanning Electron Microscope	20
 CHAPTER 4 RESULT AND DISCUSSION		
4.1	Compatibility Test	22
4.2	Core Flooding Experiment	23
4.3	Field Emission Scanning Electron Microscope	30
4.4	Skin Calculation	33
 CHAPTER 5 CONCLUSION AND RECOMMENDATION		
5.1	Conclusion	34
5.2	Recommendation	35
 REFERENCES		36
 APPENDICES		38

LIST OF FIGURES

- Figure 1: Schematic of Alkaline Flooding Process
- Figure 2: Alkaline recovery process. (deZabala, Vislocky et al., 1982)
- Figure 3: Research Methodology Flow Chart
- Figure 4: Gantt chart for FYP 1
- Figure 5: Gantt chart for FYP 2
- Figure 6: Measuring sodium chloride using electronic balance
- Figure 7: Carbon Dioxide Core Cleaner
- Figure 8: PoroPerm Machine
- Figure 9: Vacuum pump
- Figure 10: Schematic for core flood experiment.
- Figure 11: Core Flooding Relative Permeability System
- Figure 12: At the beginning of compatibility test
- Figure 13: Compatibility test after 7 days.
- Figure 14: Graph of Permeability Reduction Percentage
- Figure 15: Pressure Differential Vs time for Core 1
- Figure 16: Differential Pressure Vs Time for core 2
- Figure 17: Effluent from Oil saturate (0.5% NaOH)
- Figure 18: Effluent from water flooding (0.5% NaOH)
- Figure 19: Effluent from alkaline flooding (0.5% NaOH)
- Figure 20: Effluent from Oil saturate (1.5% NaOH)
- Figure 21: Effluent from water flooding (1.5% NaOH)
- Figure 22: Effluent from alkaline flooding (1.5% NaOH)
- Figure 23: SEM image of clean core sample at 200x magnification
- Figure 24: SEM image of clean core sample at 3000x magnification
- Figure 25: Power's scale of roundness chart (Bergslien 2012)
- Figure 26: SEM image of core 1 after core flood.
- Figure 27: SEM image of core 2 after core flood.

LIST OF TABLES

Table 1: Permeability Reduction

Table 2: Volume of oil and water displaced and recovery factor for Core 1

Table 3: Volume of oil and water displaced and recovery factor for Core 2

Table 4: Skin factor for core 1 and core 2

ABBREVIATION & NOMENCLATURES

s	Skin
k	Permeability (Darcy)
k_d	Rock permeability after damage (md)
r_d	Radius of damage zone (ft)
r_w	Wellbore radius(ft)
DR	Damage Ratio
k_i	Initial Permeability (md)
μ	Liquid viscosity (cp)
Q	Flow rate (cc/sec)
L	Length of core (cm)
ΔP	Differential pressure across core holder (atm)
A	Cross-sectional area of core (cm ²)
K_o	Initial absolute permeability, md
λ	Lumped parameter
T	Time, min
δ	Lumped parameter
S_{wc}	Critical Water Saturation
S_w	Water Saturation
S_{or}	Residual oil saturation
EDX	Energy Dispersive X-ray
OOIP	Original oil in place