

**SIMULATION OF WATERFLOODING, CARBON DIOXIDE FLOODING
AND WATER-ALTERNATING-CARBON DIOXIDE IN HEAVY OIL
RESERVOIR: COMPARATIVE EVALUATION**

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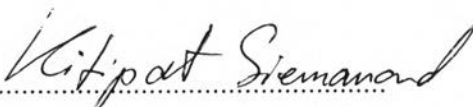
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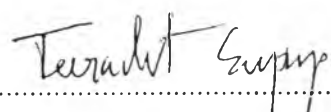

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ABSTRACT

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Wantanee Teerasukakul: Simulation of Waterflooding, Carbon Dioxide Flooding and Water-Alternating-Carbon Dioxide in Heavy Oil Reservoir: Comparative Evaluation

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A statistical review of world energy sources has demonstrated that the global oil production is not enough for current global oil consumption. Accordingly, this problem leads to the consideration of unconventional energy resources, especially heavy oil. This research investigated the efficiency and comparative evaluation of three oil recovery processes based on previous experiments and simulations. In previous experiment, two types of heavy oil with different viscosities were performed in the two sand pack permeabilities at the injection pressure of 345 kPa and 25 °C. In this study, simulation models were built by using IMEX CMG. A hybrid grid system was used and grid refinement was applied to model the radial flow, which is parallel to a horizontal well. Homogeneous porosity and permeability were assumed for all directions. The simulation indicated that the waterflooding method could produce the highest recovery factor for both types of oil and permeabilities. Oil viscosity had more impact on oil recovery than the absolute permeability. Simulation outcomes were in good agreement with the experimental results.

บทคัดย่อ

วันทนีย์ ชีระสุขะกุล: การทำแบบจำลอง เปรียบเทียบและประเมินผลการอัดน้ำเข้าทางหลุมเจาะ, การอัดคาร์บอนไดออกไซด์เข้าทางหลุมเจาะ และการอัดน้ำสลับกับคาร์บอนไดออกไซด์เข้าทางหลุมเจาะในแหล่งกักเก็บน้ำมันหนัก (Simulation of Waterflooding, Carbon Dioxide Flooding and Water-Alternating-Carbon Dioxide in Heavy Oil Reservoir: Comparative Evaluation) อ. ที่ปรึกษา: รศ. ดร. ฟาร์ฮิด โทราบิ และ รศ. ดร. จินตนา สายวรรณ 91 หน้า

การทบทวนสถิติของแหล่งพลังงานของโลกได้แสดงให้เห็นว่าการผลิตน้ำมันไม่เพียงพอต่อความต้องการการอุปโภคน้ำมันในปัจจุบัน จากปัญหาดังกล่าว นำไปสู่การพิจารณาแหล่งน้ำมันแบบไม่ปกติโดยเฉพาะอย่างยิ่งสำหรับน้ำมันหนัก งานวิจัยนี้ศึกษาประสิทธิภาพและการประเมินเชิงเปรียบเทียบของกระบวนการการผลิตน้ำมัน 3 กระบวนการที่อาศัยผลจากการทดลองและการจำลองกระบวนการ จากการทดลองก่อนหน้านี้น้ำมันหนัก 2 ชนิดที่มีความหนืดที่ต่างกันถูกทดสอบการซึมผ่านแพ็คทราย 2 ค่าที่ความดันที่ฉีด 345 kPa และที่อุณหภูมิ 25 °C ในงานวิจัยนี้ แบบจำลองถูกสร้างขึ้นโดยการใช้โปรแกรม IMEX CMG จากนั้นระบบกริดแบบไฮบริดและระบบการทำให้กริดละเอียดขึ้นถูกประยุกต์ใช้เพื่อจำลองการไหลแบบรศมีซึ่งขนานกับแหล่งน้ำมันตามแกนนอน นอกจากนี้ สมมติค่าความพรุนและค่าการซึมผ่านเป็นแบบเอกพันธ์ทุกทิศทาง ผลการจำลองชี้ให้เห็นว่าวิธีการอัดน้ำเข้าทางหลุมเจาะสามารถให้ค่าความสามารถในการนำน้ำมันขึ้นมาสูงที่สุดสำหรับน้ำมัน 2 ชนิดที่มีค่าการซึมผ่านแตกต่างกัน ความหนืดของน้ำมันมีผลกระทบต่อการผลิตน้ำมันมากกว่าการซึมผ่านแบบสัมบูรณ์ จากผลจากการจำลองสามารถสรุปว่าสอดคล้องกับผลจากการทดลอง

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TABLE OF CONTENTS

	PAGE
Title Page	i
Abstract (in English)	iii
Abstract (in Thai)	iv
Acknowledgements	v
Table of Contents	vi
List of Tables	viii
List of Figures	ix
CHAPTER	
I INTRODUCTION	1
II LITERATURE REVIEW	4
2.1 Classification of Reservoir and Reservoir Fluids	4
2.1.1 Oil Reservoirs	5
2.1.2 Gas Reservoirs	7
2.2 Reservoir Drive	10
2.2.1 Primary Recovery Drive Mechanism	10
2.2.2 Secondary Recovery Drive Mechanism	14
2.2.3 Tertiary Recovery Drive Mechanism	19
2.3 Saturations	32
2.4 Reservoir Simulation	32
2.4.1 IMEX (Implicit-Explicit Black Oil Simulation)	34
2.4.2 ECLIPSE Black Oil Simulation	35
III METHODOLOGY	37
3.1 Software	37
3.2 Experimental Procedure	37
3.2.1 Waterflooding	37
3.2.2 Carbon Dioxide Flooding	38

CHAPTER	PAGE
3.2.2 Water-Alternating-Carbon Dioxide	38
3.3 Experimental Data	38
3.3.1 Core Dimensions	39
3.3.2 Experimental Data	39
3.4 Calculating API Gravity	42
3.5 Reservoir Model Simulation	42
3.3.1 Grid Block Model	42
3.3.2 Simulation Steps of Three Recovery Methods	45
3.6 Finding Error between Experimental Results and Simulation Results	38
IV RESULTS AND DISCUSSION	49
4.1 Waterflooding Tests	49
4.2 Carbon Dioxide Flooding Tests	52
4.3 Water-Alternating-Carbon Dioxide Flooding Tests (CO ₂ -WAG)	55
4.4 Error Comparison	59
V CONCLUSIONS AND RECOMMENDATIONS	61
5.1 Conclusions	61
5.2 Recommendations	61
REFERENCES	63
APPENDICES	72
Appendix A Graph from CMG Result	72
Appendix B Simulation Steps of Three Recovery Methods	78
CURRICULUM VITAE	87

LIST OF TABLES

TABLE		PAGE
2.1	Recovery ranges of individual primary recovery drive mechanism	9
2.2	Polymer degradation mechanisms	23
3.1	Core Dimensions	40
3.2	Experimental data	42

LIST OF FIGURES

FIGURE	PAGE
1.1 Comparing world oil production and world oil consumption.	1
2.1 Typical P-T diagram for multi-component system.	4
2.2 A typical P-T diagram for ordinary black oil.	6
2.3 A typical P-T diagram for volatile crude oil.	6
2.4 Phase diagram of heavy oil reservoir.	7
2.5 A typical P-T diagram of dry-gas.	8
2.6 A typical P-T diagram of wet-gas.	8
2.7 A typical P-T diagram of Retrograde gas-condensate.	9
2.8 Unsaturated oil reservoirs.	11
2.9 Saturated oil reservoirs.	11
2.10 Gas cap drive reservoirs.	12
2.11 Water drive reservoirs.	12
2.12 Gravity drainage reservoirs.	13
2.13 Water-alternating-carbon dioxide process.	21
2.14 Micellar flooding process.	25
2.15 Alkaline flooding process.	26
2.16 Cyclic steam injection.	29
2.17 Steam Injection process.	29
2.18 Steam-assisted gravity drainage process.	31
2.19 In-situ Combustion Process.	32
2.20 Model tree view.	35
3.1 Core flooding.	39
3.2 Cross section area view of core model.	43
3.3 Side view of core model.	43
3.4 Three dimension view of core model.	44
3.5 The perforated locatation in simulation model.	44

FIGURE	PAGE
3.6 Schematic diagram of simulation steps in waterflooding.	45
3.7 Schematic diagram of simulation steps in carbon dioxide flooding.	46
3.8 Schematic diagram of simulation steps in water-alternating-carbon dioxide.	47
4.1 Comparison of three waterflooding simulations with different oil viscosities and sand pack permeabilities.	49
4.2 Comparison of waterflooding experiment and simulation with high permeable of 39.9 darcy and low oil viscosity of 440 cp.	50
4.3 Comparison of waterflooding experiment and simulation with high permeable of 38.6 darcy and high oil viscosity of 1500 cp.	50
4.4 Comparison of waterflooding experiment and simulation with low permeable of 11.4 darcy and high oil viscosity of 1500 cp.	51
4.5 Comparison of three CO ₂ flooding simulations with different oil viscosities and sand pack permeabilities.	52
4.6 Comparison of carbon dioxide flooding experiment and simulation with high permeable of 41.51 darcy and low oil viscosity of 440 cp.	53
4.7 Comparison of carbon dioxide flooding experiment and simulation with high permeable of 38.6 darcy and high oil viscosity of 1500 cp.	54
4.8 Comparison of CO ₂ flooding experiment and simulation with low permeable of 11.4 darcy and high oil viscosity of 1500 cp.	55

FIGURE	PAGE
4.9 Comparison of five CO ₂ -WAG flooding simulation with different oil viscosities, sand pack permeabilities and CO ₂ /water slug ratio.	55
4.10 Comparison of CO ₂ -WAG flooding experiment and simulation with high permeable of 43 darcy, low oil viscosity of 440 cp and CO ₂ /water slug ratio of 1:1.	56
4.11 Comparison of CO ₂ -WAG flooding experiment and simulation with high permeable of 40.6 darcy, high oil viscosity 1500 cp and CO ₂ /water slug ratio of 1:1.	56
4.12 Comparison of CO ₂ -WAG flooding experiment and simulation with low permeable of 12.6 darcy, low oil viscosity of 440 cp and CO ₂ /water slug ratio of 1:1.	57
4.13 Comparison of CO ₂ -WAG flooding experiment and simulation with high permeable of 41.95 darcy, high oil viscosity of 1500 cp and CO ₂ /water slug ratio of 1:2.	57
4.14 Comparison of CO ₂ -WAG flooding experiment and simulation with high permeable of 42.76 darcy, high oil viscosity of 1500 cp and CO ₂ /water slug ratio of 2:1.	58
4.15 Average Absolute Relative Error (AARE) calculated for each tests and different recovery factor (RF) at every 0.2 PV.	59
A1 Average Absolute Relative Error (AARE) calculated for each tests and different recovery factor (RF) at every 0.2 PV.	72
A2 The simulation result of waterflooding with high permeability sand pack of 38.6 darcy and high oil viscosity of 1500 cp.	72
A3 The simulation result of waterflooding with high permeability sand pack of 11.4 darcy and high oil viscosity of 1500 cp.	73

FIGURE		PAGE
A4	The simulation result of carbon dioxide flooding with high permeability sand pack of 41.5 darcy and low oil viscosity of 440 cp.	73
A5	The simulation result of carbon dioxide flooding with high permeability sand pack of 38.6 darcy and high oil viscosity of 1500 cp.	74
A6	The simulation result of carbon dioxide flooding with low permeability sand pack of 11.4 darcy and high oil viscosity of 1500 cp.	74
A7	The simulation result of water-alternating-carbon dioxide with high permeability sand pack of 43 darcy, low oil viscosity of 440 cp and CO ₂ /water slug ratio of 1:1.	75
A8	The simulation result of water-alternating-carbon dioxide with high permeability sand pack of 40.6 darcy, high oil viscosity of 1500 cp and CO ₂ /water slug ratio of 1:1.	75
A9	The simulation result of water-alternating-carbon dioxide with low permeability sand pack of 12.6 darcy, high oil viscosity of 1500 cp and CO ₂ /water slug ratio of 1:1.	76
A10	The simulation result of water-alternating-carbon dioxide with high permeability sand pack of 41.9 darcy, high oil viscosity of 1500 cp and CO ₂ /water slug ratio of 1:2.	76
A11	The simulation result of water-alternating-carbon dioxide with high permeability sand pack of 41.95 darcy, low oil viscosity of 1500 cp and CO ₂ /water slug ratio of 2:1.	77