ID #120

Water Alternate Gas EOR

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jh

This may also be of interest

Enhanced Oil Recovery Fundamentals and Practices

Simulation of Enhanced Oil Recovery Methods

Waterflooding from A to Z

Description

Water alternating gas (WAG) injection is an improved oil recovery method that involves three-phase fluid flow, it was implemented to improve the sweep efficiency of gas, by injecting a slug of water to control the mobility ratio and to stabilize the gas displacement front. Then was demonstrated that WAG injection in the optimized proportions leads to improved oil recovery by combining better mobility as the injected gas mix with the residual oil, and contacting upswept oil, which leads to a better microscopic displacement compared to pure gas or pure water.

WAG flooding has been successfully applied to more than 60 oilfields worldwide. This course will present WAG Miscible, WAG Immiscible, WAG alternating with different Hydrocarbon Gases and Non-HC such as N2 and CO2 Gases.

The Factors Influencing a Wag Process such as fluid properties and rock-fluid, availability and composition of injection gas, heterogeneous permeability, injection pattern, capillary pressure, relative permeability, and rock wettability will be examined in a WAG process context. A field WAG actual case is presented and discussed in the course as well as Laboratory research cases and results.

Objectives

- Describe the fundamentals of Water Alternate Gas project, study the acting Mechanisms and provide an insight of the different types of WAG process: Miscible, Immiscible, Chemical WAG, CO2 WAG, and others
- Review the EOR Screening Criteria and the constrains for WAG and Chemical methods.
- Study an actual case WAG Miscible and immiscible processes
- Comparison between WAG Alternating and Continue Injection Gas
- Understand the factors Influencing a WAG Process Design
- Review the Effect of capillary number and mobility ratio on residual oil recover
- Review the Miscibility Concepts, mathematical background and the effects of Miscible Displacement
- Review the effect of Brine Composition in a WAG displacement process and the Importance of CO2 as Injectant Gas
- Review the design parameters WAG ratio Injection pattern Injection, production, pressure and rates, the WAG cycle time.
- Discuss the technical aspects of EOR Chemical Flooding, objectives and Screening Criteria
- Evaluate Chemical applications in WAG CO2 Immiscible Process.

Audience

- Petroleum and Reservoir Engineers,
- Production and Facilities Engineers,
- Chemical Engineers interested in EOR
- Development Engineers
- Asset managers
- Geologists, and other Geoscientists involved and interested in EOR technologies.

This training can be done in house based on workshop sessions for groups of delegates with interest in understanding the principles and applications of drilling engineering fundamentals and practices.

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Content

Day 1
Introduction to EOR Methods

- Introduction to EOR methods
- Comparative Performance of Different EOR Methods.
- Study of Mechanisms of EOR in Chemical and Miscible and WAG methods
- Screening Criteria and Technical Constraints.

Day 2
Wag Processes Factors Influencing the Process Design

- Effect of Capillary Number and Mobility Ratio on residual oil recovery
- Fluid properties and rock fluid interaction
- Reservoir Heterogeneity and Stratification
- Availability and composition of injection gas
- WAG ratio
- Injection pattern Injection / production pressure and rates
- WAG cycle time and when to Initiate WAG process
- Advantages and Disadvantages of the WAG

Day 3
Field Case and Laboratory Case of Wag and Swag

- Original wells
- Configuration of the new injection well
- Configuration of the re-completed wells and a new well location
- Comparison of WAG and SWAG Recovery Techniques Conclusions

Day 4
Wag Miscible and Immiscible Displacements

- Introduction, Background and Objective of Miscible WAG
- Miscibility Concepts and Mathematical Background review
- Advantages of Developing a Miscible Displacement Front
- Effect of Brine Composition in a WAG displacement
- Importance of CO2 as Injectant Gas
- Problems Associated with WAG Process
- Literature Review

Day 5
Chemical EOR Methods Utilized in Wag Projects

- Polymers, Surfactants and Alkalis
- Alkali-Surfactant-Polymer (ASP) flooding and Micellar-Polymer (MP) flood
- Chemical Flooding Objectives, History in USA and China
- Chemical EOR Objectives and Screening Criteria
- Chemical Process Processes Evaluations
- Chemical Success CO2 WAG Immiscible
- Summary and Conclusions

End of Training