NATURALLY FRACTURED RESERVOIRS

Instructor: Dr. Djebbar Tiab
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Mewbourne College of Earth and Energy, University of Oklahoma

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Hotel Sensa, Bandung

COURSE DESCRIPTION

This course stresses practical aspects of reservoir characterization for reservoir and production engineers, with a special emphasis on:

- Assessing recovery and reserves
- Permeability-porosity modeling
- Petrophysical evaluation of naturally fractured Fractured (NFR)
- Rock typing, reservoir zoning and flow units
- Interpretation of pressure tests of vertical and horizontal wells in NFR
- Reservoir management for optimum performance

BENEFITS OF THE COURSE

At the end of this course, the participants will be able to do the following:

- Integrate rock data obtained from logs and cores
- Generate permeability-porosity relations unique to their reservoir
- Utilize data from formation evaluation tools to determine reservoir quality
- Identify and characterize flow units
- Analyze the variations in pore architecture and its effect on permeability
- Relate fracture density, aperture, and length to facies, lithology and digenesis
- Determine fracture porosity and permeability in NFR
- Calculate Porosity partitioning coefficient of a naturally fractured reservoir
• Calculate storage capacity and inter-porosity flow factor
• Analyze well tests in naturally fractured reservoirs
• Assess reservoir performance of horizontal wells in NFR
• Use MBE to analyze impact of pressure Depletion on Recovery
• Select the appropriate EOR technique for NFR

Videos and Daily Excel-based class exercises will reinforce the concepts covered in class. Participants are required to bring a personal computer to work exercises.

WHO SHOULD ATTEND?
• Petroleum engineers, such as production engineers, reservoir engineers, and other technical staff who are involved in the area of reservoir management, formation evaluation and field development.

COURSE CONTENT

PETROPHYSICAL EVALUATION OF NATURALLY FRACTURED FORMATIONS
1. Evaluation of Naturally Fractured Reservoirs (VIDEO)
2. Indicators of Natural Fractures, Visual Identification of Fractures
3. Fracture Porosity Determination
4. Porosity Partitioning Coefficient, Fracture Intensity Index
5. Permeability-Porosity Relationships
6. Fracture Porosity and Aperture from Cores
7. Fracture Area, Fracture Storage Capacity, Fracture Conductivity
8. Cementation Factor in NFR
9. NMR Response Characteristics in NFR
10. Petrophysical Characteristics for Use in Dual-Porosity Simulators
11. EXERCISES

ASSESSING RESOURCES, RESERVES & RECOVERY
1. R/P Ratio: DNA of a Company
2. Petroleum Reserves: Definitions (+VIDEO)
3. Estimating Oil in place
4. Recovery Efficiency and Reserves of Under-saturated Reservoirs
5. Recovery Efficiency and Reserves of Saturated Reservoirs
6. Estimating Reserves of a Water Drive Reservoir
7. Impact of Drive Mechanism on Recovery (VIDEO)
8. Estimating Gas Reserves
9. Recovery Efficiency, API Correlations
10. Fluid Contacts
11. Residual Oil Zone and Transition Zone
12. EXERCISES

ROCK TYPING, RESERVOIR ZONING & FLOW UNITS
1. Reservoir Environments & their Characteristics (VIDEO)
2. Permeability-Porosity Models
3. Identification & Characterization of Flow Units in Clean Formations
4. Flow units in clean sands, flow zone index
5. Reservoir characterization by the J-function
6. Identification & Characterization of Flow Units in Shaly Formations
7. Log-derived evaluation of shaly sands
8. Flow units in shaly formations, shale zone index
9. Reservoir Quality Index for Fractured Systems
10. Permeability Averaging Techniques
11. Porosity Averaging Techniques

12. EXERCISES

NET-PAY CUT-OFF, WINLAND R35 & FLOW UNITS
1. Determining Net-Pay Cut-Off
2. Winland R35 Net-Pay Cut-off
3. Cut-Off Determination in Low Permeability Sands
4. The Pittman-Apex Net-Pay Cut-Off Method
5. Net-Pay Cut-Off In Carbonate Rocks
6. Flow Unit: Winland R35, RQI, FZI and FFI
7. Flow Unit: Pittman-Apex, RQI, FZI and FFI
8. Reservoir Management of Mature Field (+VIDEO)
9. Reservoir Description & History Matching
10. Limitations of Petrophysical Evaluation
11. EXERCISES

MODERN WELL TEST ANALYSIS IN NATURALLY FRACTURED RESERVOIR
1. Fundamentals of WTA & Test Design (VIDEO)
2. Pseudo-steady state Flow Model
3. Transient Matrix Flow Model
4. Anisotropic carbonates & Interference testing
5. Composite Reservoirs
6. EXERCISES

PERFORMANCE OF HORIZONTAL WELLS IN NATURALLY FRACTURED RESERVOIRS
1. Geological Aspects of Horizontal Wells (VIDEO)
2. Horizontal well applications
3. Overview of Horizontal Wells
4. Limitations of Horizontal Wells
5. Importance of Vertical Permeability to HW Performance
6. Objectives of HW in Naturally Fractured Reservoirs
7. Horizontal Well Test Analysis
8. Anisotropic Reservoirs
9. EXERCISES

RESERVOIR MANAGEMENT OF NATURALLY RESERVOIRS
1. MBE for Dual-Porosity systems
2. Gas Reservoirs
3. Undersaturated NFR
4. Saturated NFR
5. Reservoir Management Of Mature Fields (VIDEO)
6. Study Objectives, History Matching
7. Integration of well test Data in reservoir characterization
8. Performance of water-flood in NFR
9. EOR For NFR
10. EXERCISES
DAILY SCHEDULE

Day 1
Petrophysical Evaluation of Naturally Fractured Reservoirs (NFR)

Day 2
Assessing Resources, Reserves & Recovery

Day 3
Rock Typing, Reservoir Zoning & Flow Units
Net-Pay Cut-Off, Winland R35 & Flow Units

Day 4
Modern Well Test Analysis In NFR
Reservoir Performance of HW In NFR

Day 5
Reservoir Evaluation & Management of NFR

ABOUT THE INSTRUCTOR

Dr. Djebbar Tiab served as a Professor of Petroleum Engineering at the University of Oklahoma from July 1977 to June 2014. He is the owner and general manager of his consulting company United Petroleum Technology, LLC (UPTEC), registered in Oklahoma, USA.

He received his B.Sc. (May 1974) and M.Sc. (May 1975) degrees from the New Mexico Institute of Mining and Technology, and Ph.D. degree (July 1976) from the University of Oklahoma - all in Petroleum Engineering.

Dr. Tiab is the author/co-author of over two hundred fifty (250) conference and journal technical papers in the area of pressure transient analysis, dynamic flow analysis, Petrophysics, natural gas engineering, reservoir characterization, reservoir engineering and injection processes. In 1975 (M.S. thesis) and 1976 (Ph.D. dissertation) Tiab introduced the pressure derivative technique, which revolutionized the interpretation of pressure transient tests. He developed patents for CORE LAB in the area of reservoir characterization (identification of flow units).

Dr. Tiab has consulted for a number of oil companies and offered training programs in petroleum engineering in the U.S.A. and overseas. He worked for over two years in the oil fields of Algeria for Alcore, S.A., an association of Sonatrach and Core Laboratories. He has also worked and consulted for Core Laboratories and Western Atlas in Houston, Texas, for four years (1990-1993) as a Senior Reservoir Engineer Advisor.

He received the 1995 SPE Distinguished Achievement Award for Petroleum Engineering Faculty. He also received the technical 2003 SPE Formation Evaluation Award for “Outstanding achievements in petrophysics and reservoir engineering.” Dr. Tiab received in November 2013 the Africa Education Leadership “Best Professor in Petroleum Engineering” Award. Dr. Tiab is a member of the Russian Academy of Natural Sciences.

ENROLLMENT
In order to allow sufficient time for arranging travel plans, early enrollment is recommended. Registration will be closed on 4 October 2016. Late enrollment may result in course cancellation.

CANCELLATION, SUBSTITUTION & REFUND
The tuition fee will be refunded (less US$ 100 registration fee) only if notification of cancellation is received at least 10 days prior to the commencement.

Non payment of tuition fee does not constitute automatic cancellation of participation. Substitution may be made at any time for those enrolled.

CERTIFICATE
A certificate of participation will be awarded to each person completing the course.

TUITION FEE
Tuition fee at Rp. 48,550,000 + VAT per delegate (the tuition fee will be adjusted based on the prevailing rate) is due and payable upon confirmation of enrollment. The fee is excluded accommodation. Payment should be settled at the latest on 4 October 2016. Any bank charges connected with payment in Rupiah must be added to tuition fee payment. Tuition fee includes admittance to the course, course materials, daily refreshments and full lunch.

Payment can be made to PT. Geoservices
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