Petro Management Group Ltd.

Basic Well Test Analysis Workshop

Course Objectives:

The objective of the Well Test Analysis Workshop is to provide a comprehensive theoretical and practical knowledge of well test analysis techniques. Emphasis will be placed on the practical aspects of well testing and several class examples will be offered; a scientific hand calculator will be required. Further, the use of the analysis results as a reservoir management tool to make decisions related to reservoir development and well completion will be illustrated through actual case studies throughout the workshop. Recent developments in testing of Multi-stage Frac of Horizontal Wells (MFHW's) and Mini fracing (DFIT) are now included. Also, to offer hands-on experience, attendees are encouraged to bring interesting well test data for analysis and discussion in the class, using commercial software. A detailed course hand-out, which is an excellent reference, will be provided.

Who Should Attend?

This course is aimed at reservoir, petroleum, and exploitation engineers/technologists. Other discipline staff; such as geophysicists and geologists who are involved in the field development and exploitation will also benefit from this course.

Course Instructor:

Mr. Saad Ibrahim, P. Eng, president of Petro Management Group Ltd. He has over 35 years of diversified experience in the oil and gas Industry and known as a worldwide highly recognized engineering consultant and a distinguished instructor. He also completed a post-graduate program with the University of Calgary in Chemical and Petroleum Engineering. The focus of Mr. Ibrahim's experience lies in the area of Reservoir management, and well test planning/analysis. Mr. Ibrahim is a member of APEGA and SPE.

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Course Agenda:

- **Review of the flow equations:**
  - Equation of state, Darcy and continuity equation
  - Common flow geometry

- **Dimensionless parameters:** definitions and Type Curve use/applications
- **Boundary conditions:** infinite, Pseudo- steady state and steady state
- **Solution of the diffusivity equation:** (class problem)
- **Build-up test analysis:**
  - Principle of Superposition
  - Horner Plot; average reservoir pressure (MBH) method (class problem)
  - Reservoir boundaries and channel analysis

- **Wellbore skin factor and partial penetration** (class problem)
- **Wellbore storage:** use of type curves and (class problem)
- **Draw-down testing:**
  - Application and test analysis and equivalent time
  - Reservoir Limit Testing (case study - fractured basement)

- **Hydraulically fractured wells:**
- Fracture characterization (frac. Half-length, conductivity and orientation).
- Use of type curve techniques and fourth-root time plot to evaluate frac. Efficiency
- Mini Fracs; benefits and test interpretations (DFIT) – case studies

- **Practical well testing.** How to get the most out of well testing
  - **Prior to testing** (Well test objectives, types of tests, test design)
  - **During the test** (monitoring, optimizing test design)
  - **After the test**: operational problems, data quality (pressure, production and fluids) - numerous case studies

- **Well test interpretations:**
  - Flow regime diagnoses using the pressure derivative
  - Conventional analysis
  - History matching of pressure data and selection of reservoir models
  - Case studies

- **AER well test requirements:** Guide 40 and electronic submission

- **Gas well testing:**
  - P, P^2 and Pseudo pressure-time methods
  - Gas deliverability testing: single point - Multipoint test (class problem)
  - Simplified and L.I.T.

- **Water injectivity tests:**
  - Step rate and Fall-off tests (case study)
  - Hall Plot (class problem)

- **Well test planning design**
  - Test equipment
  - Flow/Buildup test design (class study)
  - Isochronal test design (class problem)
  - Reservoir limit test (case study)
  - Horizontal well test (case study)

- **Review/analyze well tests provided by attendees including using commercial software.**

- **Closing comments and a question period**

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