



Advanced Well Test Analysis

Course Objectives:

The objective of this course is to provide an advanced level of the theoretical and practical knowledge of well test analysis techniques. The theoretical aspects will be reviewed in a concise fashion, but the emphasis will be placed on the practical aspects of the advanced techniques of well test analysis. Methods of well test analysis using both pressure transient analysis (PTA) and Rate Transient Analysis (RTA) will be illustrated with case study applications to both conventional and unconventional reservoirs, such as the Montney, Horner River, Bakken, etc. Some of the advanced techniques including deconvolution, rate and time-dependent skin factor, multi-phase analysis, and numerical analysis techniques will be discussed. Unique applications will cover modeling of Inflow Control Devices (ICD's), flow behind casing, multi-layers and multi-laterals. Also the subject of optimizing Multi Stage Frac of Hz Wells (MFHW's) will be discussed. Hands-on experience will be offered by encouraging the attendees 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, geophysicists, and geologists who are involved in the field development and exploitation and have some knowledge/experience of the subject.

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 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 APEGGA and SPE.



Course Agenda:

➤ **Review of fundamentals of Pressure Transient Analysis (PTA)**

- Equation of state, Darcy, and continuity equation
- Common flow geometry
- Boundary Conditions: infinite, pseudo steady state, and steady state
- Flow/buildup test: Horner plot, Type curve matching, and Wellbore Storage
- Draw-down and Reservoir Limit Test

➤ **Steps of Well Test Analysis**

- Stages of well testing
- Flow regime diagnoses
- Boundary models and reservoir models
- Reservoir Limit Testing (case examples)
- Applications of PTA and RTA for tight and unconventional reservoirs

➤ **Recent Developments of Well Test Analysis Techniques**

- Deconvolution techniques
- Multi-phase test analysis; gas condensate, oil multi-phase (Case studies)
- Complex Boundary models
- Numerical test analysis (Case study)
- Modeling of Inflow Control Devices (ICD's)
- Modeling of multi-lateral
- Modeling behind casing flow (BCF)

➤ **Optimization of Multi-stage Fracing of Horizontal Wells (MFHW); including:**

- Hz well spacing optimization (Case study)
- Frac size and the number of frac stages optimization (Case study)
- Taking advantage of sweet spots – quantifying benefits (Case study)

➤ **Review/analyze well tests provided by attendees.**

➤ **Final remarks, period of questions/discussions**