



# Applied Fracture Pressure Analysis for Complex Reservoirs

*Training – Dr. Michael B. Smith*

## \* What Is Covered ?

This course is designed for engineers involved in detailed design and analysis of hydraulic fracture treatments. A good understanding of, and familiarity with, fracturing fundamentals, materials selection (fluids/proppant), and applications is required. Emphasis is placed on analyzing fracturing pressure data during pumping, and during the subsequent pressure decline, and use of this data to recognize common problems. A wide range of real field problems will be tackled in the practical sessions (which comprise more than 50% of the course). Some of the subjects covered include:

- Introduction & Overview
  - Fracture Geometry Principles
  - In situ stress test procedures/analysis
  - Pressure Decline Analysis Theory
- Pattern Recognition in Fracturing Pressure Analysis
  - Use of log-log analysis plots
- Spurt Loss
  - Effect on Pressure Analysis & Treatment Design
  - Case History
- In Situ Stress Logs
  - Basic Theory of Logs
  - Use of Fracturing Pressure Data to “Calibrate” Logs
  - Case History
- Core Analysis and Lab Test Procedures for Acquiring Fracture Design Data
  - Effects of Well Deviation
    - Fracture/Wellbore Communication
  - Horizontal Well Treatment Design Tip Screenout Fracturing
    - Theory of TSO Treatment Design
    - TSO Treatment Design (w/Case History)
  - Pressure Dependent Fluid Loss
    - Analysis & Effect on Treatment Design
    - Case History
  - Fracturing for Sand Control
    - Theory
    - Frac-Pack Case History
  - Reservoir Response from Fracturing
    - Turbulent Flow effects
    - Effects of “heterogeneity” in formation “kh” & fracture “k<sub>f</sub>w”
    - Effects of limited wellbore/fracture communication

## \* How Is It Presented ?

The “workshop” format for this course uses examples of actual problem wells from various environments. These examples place emphasis on 3-D fracture modeling for analysis/design, and the sessions are conducted using NSI’s fracture simulators StimPlan/E-StimPlan. The course includes NSI’s comprehensive manual, augmented with special material discussing fracturing in complex formations. This also includes multiple, detailed, **solved** case histories ranging from Australian tight gas wells, to Gulf of Mexico “frac-packs”, to North Sea tip screenout (TSO) treatments.

Practical applications during the week are built on complete, detailed, real field problems. This format, used very successfully in other courses, enables participants to work with many real field examples and thus gain a deeper understanding of the subject in a short time. Participants are encouraged to bring data sets from their own fractured (or fracture candidate) wells for use in the practical sessions.

## \* What About The Instructor ?

Mike Smith, with a Ph.D. in Rock Mechanics from Rice University, has over 20 years experience in rock mechanics, well completions, and hydraulic fracturing. While with Amoco Production Company, Mike co-developed the framework for fracturing pressure analysis that revolutionized fracturing technology. Along with worldwide consulting, Mike has served as an SPE Distinguished Lecturer, authored multiple chapters in the recent fracturing SPE Monograph, and developed and presented SPE short courses on Fracturing

Pressure Analysis. Most recently, Mike was presented the SPE Lester C. Uren Award for his contributions to hydraulic fracturing technology.

**For Details Please Contact NSI – Phone 1-918-496-2071 or [info@nsitech.com](mailto:info@nsitech.com)**  
Enrollment is very limited to allow maximum interaction/discussion



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## \* Additional Information

This course is not properly described as an "Advanced" course. Particularly since NSI's Hydraulic Fracturing course provides a very complete (not to say "advanced") general course in the subject. Rather, this "2nd" course is a different style, with a more descriptive title possibly as seen above.

What this course tries to accomplish is to examine non-ideal aspects of fracturing (and particularly fracturing pressure analysis) in a workshop environment, i.e., talk about something and then work through a complete field case history. Thus, in terms of pressure analysis this 2nd course is fast paced - we jump right into it. "Normal" frac stuff such as fluids, proppants, etc., is not even included as a part of this 2nd course.

The course does use NSI's StimPlan simulator as part of the course (as we do for the "1st" course, but to a greater degree in this "2nd" course), but mostly for manipulating data, doing plots, etc. More than 50% the people who have taken the "2nd" course do not routinely use StimPlan, and this has never created a problem. We purposefully try our best NOT to make either course a "software" course -- rather we want them to be about frac theory.

Primary requirements for this "2nd" course are:

- Attendance at NSI Hydraulic Fracturing Course,

or

- Basic familiarity with:

- Fracturing pressure analysis since we jump right into this,
- Basic fracture design variables (Height vs. In Situ stress, Modulus, Fluid Loss Coefficient, and Tip Toughness),
- Fluids and fluid viscosity.

The course is designed for engineers involved in detailed design and analysis of hydraulic fracture treatments.