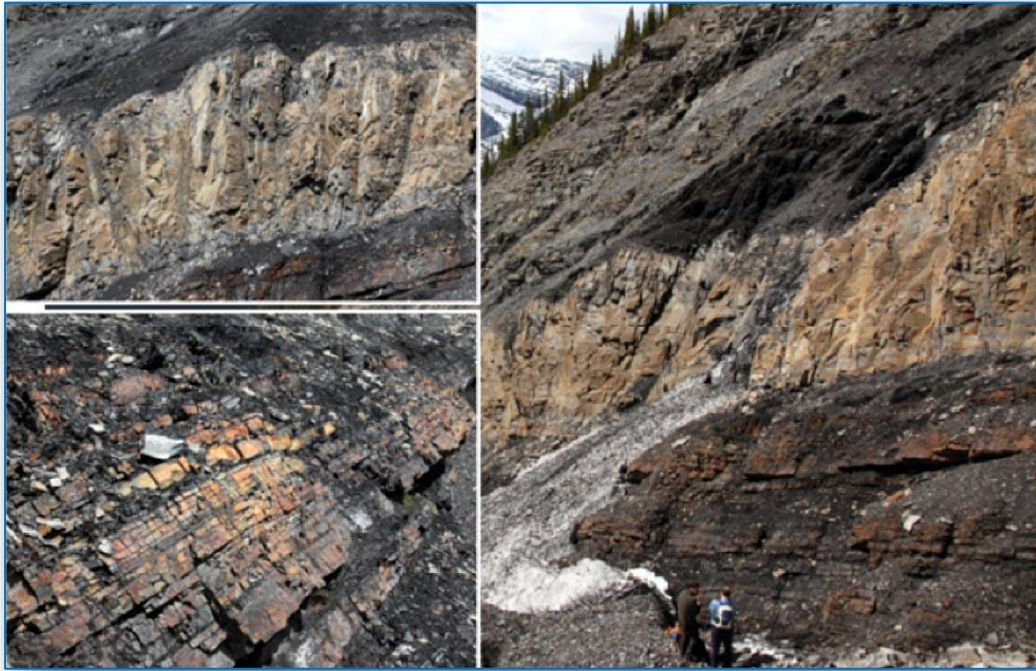




DE116

Naturally Fractured Reservoirs Characterization & Analysis

Course Introduction:

This five-day course covers reservoir engineering, well testing, and simulation aspects of naturally fractured reservoirs. Specifics include: fracture description, connectivity and network; fracture properties; physical principles underlying reservoir engineering and modeling naturally fractured reservoirs; local and global effects of viscous, capillary, gravity and molecular diffusion flow; dual-porosity/dual-permeability models; multi-scale fracture model; dual-mesh model; streamline model; transient testing with non-Darcy flow effects; tracer injection and breakthrough analysis; geomechanics and fractures; compositional model; coal-bed gas model; oil and gas from fractured shale; improved and enhanced oil recovery in naturally fracture reservoirs.

Course Objectives:

Upon successful completion of this course, the delegates will be able to:

- ✓ Define what is a fracture reservoir
- ✓ Appreciate the economic importance of fractured reservoirs
- ✓ Identify and quantify the characterization of fractured reservoirs
- ✓ Understand reservoir modeling of fractured reservoirs
- ✓ Discover the typical behavior of fractured reservoirs
- ✓ Improve the management of fractured reservoirs
- ✓ Detect and predict subsurface natural fracture occurrence and intensity from cores and well logs
- ✓ Determine fractured rock properties affecting reservoir performance
- ✓ Design and analyze pressure transient tests in naturally-fractured reservoirs
- ✓ Evaluate reservoir performance in naturally-fractured reservoirs
- ✓ Develop and apply numerical simulation models to fluid-flow in naturally-fractured reservoirs
- ✓ Apply coupled geomechanics/fluid-flow behavior to reservoir management strategies in naturally fractured reservoirs
- ✓ Evaluate the impact of natural fractures on hydraulic fracture stimulation

Who Should Attend?

This course is intended for all engineers and geoscientists interested in a multi-disciplinary approach to evaluating and predicting the overall effect of natural fractures on subsurface fluid-flow and subsequent reservoir performance.

Course Outline:

Day 1:

ORIGINS AND CHARACTERISTICS OF FRACTURED RESERVOIRS

- Fracture classification and fracture fill types
- Modes of formation of natural fractures
- Introduction to the stress tensor & Tectonic stresses
- Stresses and rock failure
- Failure envelopes
- Natural fracture system controls
- Regional Fractures
- Joint spacing vs layer thickness
- Tectonic Folds
- Fold related fractures
- Fault related fracturing
- Fault damage zones
- Miscellaneous natural fracture origins

Day 2:

SAMPLING AND ANALYSIS OF NATURAL FRACTURES

- Wellbore sampling
- Fracture detection (fracture density)
- Fracture Aperture
- Fracture distribution
- Fracture orientation
- Fracture sets, types & fill
- Fracture Permeability

Day 3:

GEOMECHANICS OF FRACTURED RESERVOIRS

- Maximum horizontal stress (S_{hmax}) orientation
- Vertical stress (S_v)
- Minimum horizontal stress (S_{hmin}) magnitudes
- Maximum horizontal stress (S_{hmax}) magnitudes
- Rock properties
- Failure criteria
- Failure envelopes
- Influence of in-situ stress on fracture permeability

Day 4:

RESERVOIR MODELING OF FRACTURED RESERVOIRS

- Geocellular reservoir models
- Calculating fracture permeability in a property grid
- Analytical effective fracture permeability tensor
- Fracture matrix interaction
- Percolation theory
- Fracture system connectivity
- Representative elementary volume
- Discrete Fracture Network models

RESERVOIR ENGINEERING AND DYNAMIC SIMULATION

- Basic Principles
- Rock Properties
- Well Productivity
- Well testing
- Recovery mechanisms
- Modeling of fractured reservoirs

Day 5:

- Influence of mechanical stratigraphy and structure on fracture development
- Detection and prediction of subsurface natural-fracture occurrence and intensity from cores and well logs
- Fractured rock properties affecting reservoir performance
- Classification of naturally-fractured reservoirs with reservoir examples and potential production problems
- Naturally-fractured reservoirs: fluid-flow, well performance and well testing, reservoir performance, numerical simulation
- Geomechanics/fluid-flow
- Behavior and stimulation of naturally-fractured reservoirs
- Effects of natural fractures on reservoir permeability, anisotropy, drainage area, and waterflood sweep efficiency

Course Certificate:

International Center for Training & Development (ICTD) will award an internationally recognized certificate(s) for each delegate on completion of training.

Course Methodology:

A variety of methodologies will be used during the course that includes:

- (30%) Based on Case Studies
- (30%) Techniques
- (30%) Role Play
- (10%) Concepts
- Pre-test and Post-test
- Variety of Learning Methods
- Lectures
- Case Studies and Self Questionnaires
- Group Work
- Discussion
- Presentation

Course Fees:

To be advised as per the course location. This rate includes participant's manual, hand-outs, buffet lunch, coffee/tea on arrival, morning & afternoon of each day.

Course Timings:

Daily Course Timings:

08:00 - 08:20	Morning Coffee / Tea
08:20 - 10:00	First Session
10:00 - 10:20	Coffee / Tea / Snacks
10:20 - 12:20	Second Session
12:20 - 13:30	Lunch Break & Prayer Break
13:30 - 15:00	Last Session