

Petroleum Geomechanics 3-Day Course Outline

Introduction and Course Outline

- Introduction
- Overview of course content
- Summary of petroleum geomechanics applications
- Course Outline and schedule

Rock Mechanics Basics #1: Stress, Strain and Faulting

- Stress
- Strain
- Resolving Forces and Stresses
- The Stress Tensor
- Review of Mohr Circles in 2D and 3D
- Rock Friction
- Cohesion and Coulomb Failure
- Mohr Failure and Griffith Cracks
- Fault and Fracture Meshes
- Andersonian Fault Classification

Determining Stress Orientation from Well Logs

- Stress around boreholes
- Breakouts and Drilling-Induced Fractures
- Acoustic Image Logs
- Four-Arm Caliper Logs
- Resistivity Image Logs

Practical Exercise: Stress Orientation Determination

- Four-arm caliper log interpretation
- Image log Analysis

Determining Stress Orientation from Well Logs (continued)

- Other Logs
- Quality ranking of Stress Data
- The World Stress Map Project

Questions and End of Day One

Introduction to Day Two

- Review of Day One
- Day Two Outline
- Day Two Aims

Stress Sources in the Crust

- Plate Boundary Forces
- Intra-Plate Sources of Stress
- Plate-Scale Stress Fields
- Controls on Stress in Sedimentary Basins
- Basin and Field-Scale Stress Fields
- Superposition of Stresses

Determining Stress Magnitudes in the Oil Patch

- The Stress Tensor in the Oil-Patch
- Calculating Vertical Stress Magnitude
- Fracture Tests and Minimum Horizontal Stress Magnitude
- Fracture Gradient Relations

Practical Exercise: Minimum Horizontal Stress Determination

- Vertical stress
- LOT and XLOT calculations
- Fracture gradient relations

Effect of Pore Pressure (depletion/overpressure)

- Role of Effective Stress
- Pore Pressure-Stress Coupling
- Implications of Pore Pressure-Stress Coupling

Questions and End of Day Two

Introduction to Day Three

- Review of Day Two
- Day Three Outline
- Day Three Aims

Determining Stress Magnitudes in the Oil Patch: Continued

- Determining Maximum Horizontal Stress
- Frictional Limit
- Circumferential Stress Modelling
- Hydraulic Fracture Relation
- Overview of Geomechanical Modelling

Practical Exercise: Maximum Horizontal Stress Determination

- Frictional limit
- Circumferential Stress Modelling
- Hydraulic Fracture Relation

Petroleum Geomechanics Applications

- Constraining Neotectonics
- Fracture Stimulation
- Stress and Fluid Flow
- Fractured Reservoirs
- Fault Sealing
- Wellbore stability

Practical Exercise: Petroleum Geomechanics Applications

- Wellbore stability
- Naturally fractured reservoirs
- Production issues

Questions and Course Wrap-up