Petrogenium. Academy

Upstream (Geology)

Faults, Fractures, and Seals in Petroleum Reservoirs

Consultant / Trainer

Tim Needham

The **Petrogenium (in collaboration with EPTS) Faults, Fractures, and Seals in Petroleum Reservoirs** course will guide the participants with respect to understanding of fluid flow in the subsurface and the control imposed by geological structures. Flow of oil and gas through porous reservoir rock is controlled by the permeability of the reservoir. In the simplest case this is a single permeability system that is completely controlled by the rock properties of the reservoir. The presence of faults and/or fractures complicates the flow by creating a dual porosity/ permeability system: open fractures act as fluid conduits and result in flow anisotropy, while sealing faults or fractures create barriers to flow or even reservoir compartmentalization.

Participants

This **Petrogenium.** course is aimed at Geologists, geophysicists and reservoir engineers who have to work with faulted and fractured reservoirs will benefit from this short course. The topic is relevant for exploration as well for production.

Learning Objectives

In this course the origin of faults and fractures and their mechanical properties will be discussed in a framework of geo-mechanics.

- Fundamentals of geomechanics
- Origin & physical properties of faults
- Origin & physical properties of fractures
- Fault seal behaviour under varying stress fields
- Predictive models for fault and fracture fluid conduit behaviour.
- Compartmentalization in structurally complicated reservoirs.

Programme

DAY 1

Introduction To Geomechanics And Structural Geometries

General fault, fracture and structure characteristics. To create a 'common ground' in the group, the first day will be spent on general aspects of the application of structural geology and geomechanics in the E&P business. Introduction to stress and strain, some rock mechanics, geometrical analysis and the application of these subjects to geological phenomena as encountered in the oil and gas business. Workflows for successful fault, fracture and seal analysis will be introduced.

DAY 2

Extensional Tectonics: Normal Faults And Rifts

Theory, examples, seismic interpretation. Structural geometries and fault properties that are characteristic for extensional tectonic regimes will be treated during Day 2. Topics will include fault geometry, growth, linkage and QC of interpretations. Analysis of fault and fracture systems, including fractal properties of fault and fractures and prediction of sub-seismic faults will also be addressed. Structural interpretations of normal faults will be placed in their context for fault and fracture analysis.

DAY 3

Compressional And Strike-slip Tectonics: Fold-and-thrust Belts, Inversion & Strike-slip

Compressional tectonics: fault reactivation - multi-phase tectonics. Theory, case histories, analogue models, seismic interpretation exercise. Structural geometries and fault properties that are characteristic for compressional tectonic regimes will be treated during Day 3. The mechanics of fault reactivation (inversion tectonics) will also be discussed. Strike-slip tectonics will also be covered in terms of theory, case histories, analogue models and seismic interpretation. The 3D nature of this tectonic setting including pitfalls and traps in structural interpretation will receive special attention. Structural interpretations of contractional and strike-slip systems will be placed in their context for fault seal and fracture analysis.

Programme

DAY 4

Salt Tectonics, Subsurface Pressures, Fluid Properties And Fault Rocks

The day will commence with a review of salt structures in different tectonic settings and their influence on faults, fractures and fault sealing. The origin and effects of normal and abnormal subsurface pressure will be explained. Understanding will be supported through exercises. The properties of fluids and their influence on fault seal and multiphase flow will also be covered. Subsequently, understanding of the influence of tectonics on hydrocarbon development will be improved through an exercise. The different types of fault rocks, their microstructural and petrophysical characteristics will be described. Identification of faults and fractures (natural and coring induced) in cores and borehole images will also be covered.

DAY 5

Faults And Fractures - Impact On Hydrocarbon Entrapment And Fluid Flow

Fault sealing mechanisms and approaches to evaluate seal integrity in exploration and in production scenarios will be dealt with including the use of seal algorithms. Fracture systems: fracture mechanics, reservoir examples and outcrop examples. The sessions will include fracture mechanics, fracture types, natural fracture systems and their influence on reservoir characteristics and production strategies. The influence of in situ stress on fault sealing and flow through fractures will be part of the material. The incorporation of fault seal and fracture systems into reservoir models will also be addressed.

Why select Petrogenium.?

The above support will be provided by principal consultants with 30+ years world-class experience in the technology and hands-on know-how from operation of refinery units.

Contact Petrogenium.:

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