Seals, Reservoirs and Prospects Risk assessments for E & P (Three days)

Course Description

The optimum trap is a reservoir capable of confining and economically delivering hydrocarbon under a competent sealed cap and /or faulted structural closure. Sealing competence is essential for trapping, lateral and vertical distribution of hydrocarbons in a prospective reservoir. The sealing capacity is also impacts reservoir flow rate and driving mechanism of the natural flow, and the secondary recovery process. Subsurface geopressure compartmentalization plays an essential role in determining seals and reservoirs characteristics.

This course will demonstrates to participants how to use measured pressure data from wire-line tests (MDTs, RFTs etc.) and production tests (DST's) to design pressure-depth plots which reveal permeability barriers (sealed) , communications, and breached reservoir (seal failure).
It will also examine how seismic velocities (RMS) and well logs petrophysical properties establish the predicted pore pressure in the seals. A short review of seals and reservoirs development in supra and sub salt plays will be discussed. Moreover, participants will gain the fundamentals knowledge of predicting pore-fracture pressure and the drilling tolerance window that leads to successful drilling prognosis to the targeted formation.
Hands-on experience will be provided by several class projects. Analog and digital data (Excel software) will be utilized to assess and evaluate a prospect risk. Participants will make an analytical scheme for the development phase of the whole prospect. Before drilling risk assessment and post drilling appraisal methods will be clarified and how to salvage a prospect with a dry hole wildcat will be discussed.

Who should attend?
Geologists, geophysicists, drilling and reservoir engineers, well log analysts, managers, and support staff involved in exploration, development and drilling.

Learning outcomes:

1. Understand the causes, concepts and graphic representations of vertical and horizontal compartmentalization due to reservoirs partitioned by seals
2. Comprehend pressure gradient in seals versus reservoirs and the causes of disparity between measured and predicted values
3. Recognize sealed vs. breached reservoirs
4. Calculate hydrocarbon column in four ways vs. three way faulted closures
5. Evaluate and assess the risk of a prospect pre and post drilling

Course information

Subsurface Compartmentalization:

- Vertical and lateral subsurface compartments
- Pressure gradient in seals vs. reservoirs
- Causes of pressure transgression and regression across seals
- Salt basins rock mechanics and their impact on seals and reservoirs.

Reservoirs:

- Direct and pertinent measurements
- QC, calibrate and validate measured data for analysis
- Graphic representations (PSI and PPG MWE), including some of their pitfalls

Cap Seals (four ways)

- Lithology, age and pressure decay
- Seismic velocity - Well logs and calibration of prediction model
- Sealing capacity vs. hydrocarbon retention capacity calculations.
- Salt seals

Fault Seals. (Faulted three ways)

- Fault types: their rock mechanics and pressure yield
- Cross fault beds-juxtaposition, fault geometry and hydrocarbon spills
- Capillary pressure vs. excess pressure across faults
- Shale smear potential seal: calculations and uncertainty
- Counter- regional dip and fault seal
- Pulsed sealed fault leakage

Prospect Evaluation

a) **Pre drilling**

- Seismic stratigraphy
- Predict sealing capacity from seismic and offset wells
- AVO assessment

b) **Post drilling**

- Appraise success and /or failure
- Define hydrocarbon type, density, thickness (water contact), lateral extension and down-dip limits
- Calculate excess pressure, communication and reservoir driving mechanism
- QC and assess of pre-drill DHI, AVO and low resistivity pay
- Identify bypass pay zones and additional sealed structural closures in the same prospect for future E & P.

A 5 day course (expanded version of the 3 day geopressure course) is available "Geopressure: Prediction, Analysis, and Risk Assessment for E&P" focuses on ***know how*** *and* ***in depth exercises and analyses.*** Hands-on experience will be provided by several case history data. Microsoft Excel is used for the 5 day course and pore pressure prediction software is not required.