3D Seismic Data Interpretation Techniques & Methods

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Introduction:

This course is designed to give a broad-based review of the key seismic interpretational techniques relevant to subsurface analysis. The nature of the seismic response will be considered with reference to both structural evaluation, and methods for stratigraphic analysis. The analysis of fluid types will also be considered, along with attribute analysis and display techniques.

Objectives:

By the end of this BTS training course, participants will be able to:

- Evaluate more effectively their seismic datasets and what interpretation is possible
- Perform the principal seismic interpretational techniques for structural, stratigraphic and reservoir scale evaluation
- Assess the importance of key seismic data characteristics, such as resolution, phase, wavelet shape, dynamic range and processing artefacts
- Manage the main facets of structural interpretation, such as correlation, tracking, slicing, composite and volume displays
- Appraise the forms of stratigraphic interpretation within a 3D seismic dataset and demonstrate the leading techniques for the extraction of stratigraphic information, such as horizon slices

- Judge the main limitations of seismic display, specifically color, phase, polarity and resolution and how they may be overcome and harnessed to elucidate further detail in a dataset
- Assess the multiplicity of hydrocarbon reflection characteristics, enabling more hydrocarbon reserves to be found through seismic interpretation

- Perform those techniques and understand the limitations that allow the seismic method to be pushed to the reservoir scale
- Evaluate the range of seismic attributes and establish how to select the correct one for the problem at hand.
- Manage the use of 3D seismic data in the reservoir evaluation process and examine how to determine such reservoir properties as net-to-gross ratio, net pay, porosity and pore volume.

Who should attend?

Geologists, Geophysicists, Reservoir Engineers, Production Engineers, Petro physicists, Petroleum Engineers, Drilling Engineers, Field Development Engineers, Managers, Asset Managers, Oil & Gas Engineers, Reservoir Operators, Surveillance Engineers, Technicians, Engineering Trainees, Technical Managers, Technical Assistants, Technicians, Chemists, Physicists, Technical Supervisors, Service Company Personnel responsible for improving the performance of petroleum reservoirs, experienced subsurface professionals from other disciplines who require a working knowledge of seismic interpretation techniques

Course Outline:

Introduction

- Vertical seismic resolution
- The two resolution limits
- The seismic wavelet
- Importance of amplitude and phase control
- Dynamic range
- Horizontal seismic resolution
- Fresnel zone
- Seismic migration
- Regularity and acquisition footprint

Structural Interpretation

- Slicing the cube, time (or depth) slices and their importance
- Fault handling
- Contouring exercise
- Structural case histories
- Interpretable structural detail

- Composite and volumetric displays
- Phase sections
- Subtle faults and their detection
- Coherence
- Autotracking and its precision, time-derived horizon attributes

- Tracking validation
- Generalized procedure
- Interpretation confidence

Stratigraphic Interpretation

- Recognition of characteristic shapes
- Importance of strike view
- Channels, bars, levees, dunes and carbonate features
- Resolution limitations
- Horizon slices and their methods of construction
- Reconstitution of depositional surfaces
- Stratigraphic patterns to verify structure, unconformities
- Turbidite mapping exercise

- Recognition of data phase
- Data polarity
- Natural pairing and phase circles

Colour and Phase

- Limitations of conventional display
- Colour principles
- Contrasting and double and single gradational schemes
- Visibility of amplitude detail
- Scales

Reservoir Identification

- Bright spots
- Dim spots
- Phase changes
- Flat spots and their necessary characteristics
- Impact of color
- Amplitude and display scales
- Use of top and base reflections and spatial relationships

- Tuning phenomena in reservoir reflections
- Importance of zero-phaseness and knowledge of polarity
- Approach to validation
- Reservoir limits
- Occurrence of fluid effects
- Reservoir identification exercise

Attributes

- Classification
- Amplitude-derived and frequency-derived horizon attributes
- Windowed attributes
- Hybrid attributes
- 3D AVO

Reservoir Evaluation

- Properties affecting amplitude
- Interpretation regimes
- Well calibration

- Composite amplitude
- Mapping of porosity
- Net-to-gross and net pay thickness
- Tuning estimation and removal
- Pore volume
- Case histories