“Professional Level Rock Physics for Seismic Amplitude Interpretation”

A practical 3-day course presented by Dr. Rob Simm

About the Course

This course builds upon the ‘Essentials of Rock Physics for Seismic Amplitude Interpretation’ focusing on the rock physics basis of seismic interpretation and practical application. Lecture topics are intertwined with exercises that utilize the RokDoc™ rock physics software. This is not a software course and no previous experience of the software is required. Attendees will receive a fully documented manual with text discussion, including all illustrations shown in the course.

Who should attend?

The course is designed for geoscientists (geophysicists and petrophysicists are the likely target audience) who have had some exposure to rock physics, AVO and inversion on working projects and would like to know more.

About the Presenter

Dr. Rob Simm is a seismic interpreter who specialises in applying rock physics in oil and gas exploration and production. With 24 years experience in oil industry exploration and field development, Rob has spent most of his career with operating oil companies (notably Britoil, Tricentrol and Enterprise Oil). In 1999 he established his own consultancy company, Rock Physics Associates Ltd, to provide project and training services.

Commissioning the Course

This course can be commissioned for in-house presentation. For details and any other information please contact:
Rob Simm tel. +44(0)1582 622039

Course Contents – Lecture Topics

Review of AVO Fundamentals

- The rock property basis of AVO analysis
- The scaling issue addressed through well ties
- Understanding AVO discrimination in terms of data projections

Rock Physics for Seismic Modelling

- Quicklook workflow (single value Gassmann and single interface AVO modelling reviewed)
- Applying Gassmann to Log data - a workflow
- Gassmann issues:
  - effective vs total porosity
  - fluid mixing - homogeneous vs patchy saturation
  - various approaches to shear prediction
  - invasion corrections
  - fluid substitution and its pitfalls
- Modelling variations in shale content and porosity (lithology substitution)
- Frequency considerations - Gassmann, Biot and squirt flow
- The role of theoretical rock physics models (eg critical porosity model, Xu-White and other models)

AVO—Reflectivity and Elastic Inversion

- Essentials level AVO and impedance estimation from seismic will be reviewed
- Simple net pay estimation using bandlimited impedance and AVO
- The problems associated with AVO calibration including data quality issues
- AVO calibration and elastic inversion case studies

Rock Physics and Probability

- Facies discrimination workflow.
- Upscaling log data (Backus average methodology)
- Facies classification
- Defining probability models (using Fuzzy Logic)
- Applying the fuzzy logic model to compare the performance of various attributes in noise free discrimination

Rock Physics in Time Lapse Seismic Interpretation

- Introduction to time lapse seismic with some examples
- Rock physics issues in calibration -
  - Pressure sensitivity to the dry rock frame - model fitting and the role of lab data
  - Patchy saturation and fluid mixing modeling

Anisotropy

- Basic introduction to anisotropy related to horizontal layering (VTI) and vertical fractures (HTI, azimuthal anisotropy)
- Approximations for modelling VTI and HTI
- Impact of VTI on PP reflectivity interpretation (conventional AVO)
- Detecting fractures using shear wave technologies
- Using P waves to detect fractures (AVD)

Course Contents – Exercises

- Quicklook workflow - Gassmann fluid substitution, AVO modelling, Determining angle vs offset, predicting reflectivity character at a given angle
- Log conditioning workflow (including shear log QC and correcting for invasion)
- Forward modelling using the Xu-White model
- 2D AVA modelling - lithology vs fluid reflectivity signatures
- Elastic inversion interpretation exercise
- Probability - Facies discrimination using Fuzzy Logic—determining optimum elastic discriminants
- Investigating the effect of anisotropy (VTI) on AVO reflectivity
- Evaluating time lapse effects