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«MODERN ROCK PHYSICS: QUANTITATIVE INTERPRETATION OF SEISMIC DATA», 5 days

COURSE OBJECTIVE:

Development of professional competencies of petroleum engineers in Rock physics (petrophysical modeling, AVO analysis), modeling of various scenarios (change of porosity, fluids, shaliness, and its influence on AVO, AI parameters, and VpVs), inversion technic, and sweet spots identification.

ACQUIRED ABILITIES:

- Apply petrophysical modeling;
- Calculate Kdry, Ksat, RHOB, Vp, Vs, AI and VpVs parameters for various scenarios;
- Create models of various AVO scenarios;
- Perform AVO analysis;
- Calculate AI and VpVs parameters for different formations;
- Analyze seismic inversion;
- Make reservoir parameters assessment: porosity, fluid phase, lithology and shaliness;
- Identify sweet spots.

COURSE CONTENT:

Module Name	Content
Seismic data: review	Quality and parameters of a seismic data. Seismic data processing. Wavelet, phase and polarity. Seismic to well time.
Petrophysical modeling	Application of Rock physics on different stages of Petroleum exploration and production. Rock parameters in Rock Physics. Solid and fluid elastic properties, affecting factors. Fluid substitution, Biot Gassmann. Calculation of Vp and Vs, AI and VpVs. Exercise: calculation of Kdry, Ksat, Vp, Vs, RHOB. Cross plots. AI and VpVs, dependence on porosity, seismic facies, lithologies, HC saturation effect. Petroelastic models. Principles of Petroelastic modeling. Theoretical and empirical Rock Physics models. Application of rock physics models for quantitative interpretation. Rock physics models for mechanical and chemical compaction in reservoir rock.
Seismic attributes: spectral decomposition	Spectral decomposition technics and application.
AVO and seismic	Trace amplitudes. Effect of processing on AVO quality. Tunning. Creating

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amplitude study	models of various AVO scenarios. Net thickness prediction in thin beds. AVO modeling for different fluids. AVO A and B parameters. Examples of AVO application for assessment of fluids, lithology, reservoir quality. Seismic amplitude analysis. Exercise: AVO curve for various scenarios.
Seismic inversion	Seismic frequency range. Low frequency problem in inversion. Quantitative interpretation of inverted data. Petroelastic modeling bounds. Stages of Rock Physics project. Fracture modeling. Statistical inversion.
Rock Physics application	Formation thickness. Formation assessment: porosity, fluid phase, lithology, and shaliness. Exercise: calculation of AI, VpVs for various scenarios. Seals. Risking. Resource assessment.
Field examples	Examples of Rock Physics application in petroleum exploration and production.
Practical exercises	Exercises: AVO, inversion, calculation of petrophysical parameters.