Applied Seismic Anisotropy for Fractured Reservoir Characterization - ASAF

COURSE

About the Course

The course is designed to enable you to perform professional geophysical work to evaluate fractured reservoirs and/or reservoirs that require hydrofracturing to produce. The emphasis of the lectures is steered to the participants' work assignments. Field data case histories and laboratory data illustrate the principles and practices of calibrating azimuthal travel times and azimuthal prestack amplitudes against independent measurements of in-situ horizontal stresses, and natural fractures that flow fluids. The course covers acquisition design and Q/C, azimuthal processing, interpretation, and modeling to test different interpretations. The skills that you will learn will also involve integrating the support data - well logs, production testing, VSP, core work - with your reflection seismic data. Each section of the course is supported with a classroom exercise. The skills you will learn include identifying the effects of the two types of seismic anisotropy on seismic data. You will learn how to employ anisotropy to accomplish your reservoir-related goals. Seismic anisotropy is everywhere in the layered sedimentary rocks, but in the past, geophysicists have often ignored it, sometimes because they didn't collect the data that reveal its presence, and other times because they didn't understand the benefits that properly recorded and processed anisotropic data provide. The class is usually designed as lectures in the morning, with field-data analysis in the afternoons. If the course is taught as an in-house course, with your own properly acquired and properly processed 3D data, then software applications useful for fractured reservoir analysis will be used during the class. Hands-on exercises are included in the class, so that each participant learns by doing the analysis.

"The demonstrations were very effective. Made a difficult subject much more understandable. Thanks!" - Participant, United States

Target Audience

Geophysicists assigned to evaluate fractured reservoirs; also, geoscientists assigned to evaluate resource plays hydro-fractured for production. Multicomponent seismology, as well as azimuthal P-P, is offered in the course, because the recording of both the P- and the S-wave is extremely beneficial for fractured reservoir analysis and/or resource plays. The introductory lectures are also suitable for geologists and reservoir engineers who wish to know how seismic data can help them to understand the 'plumbing' of the reservoir and the in-situ stress state of the reservoir. The course is designed for the working interpretation geophysicist/geo-scientist, who is assigned to evaluate reservoir(s).

You Will Learn

Participants will learn how to:

- Specify what set of geologic and/or engineering questions need to be asked with regard to your reservoir and your play; to specify the geophysical data that need to be acquired to answer the above geologic questions; design acquisition parameters; lay out the processing sequence required; quality-check quality-assurance during processing; interpret the final processed data; model the data to test different interpretations.
- Identify what support data is required for the successful fracture/in-situ stress characterization survey and project. You will learn about the two types of seismic anisotropy is, where it comes from, and what happens to projects that ignore the anisotropy that is everywhere in the layered sedimentary rocks that contain most of the hydrocarbon reservoirs. You will learn how the two types of seismic anisotropy are visible in properly acquired and properly recorded reflection seismic data.
- Employ azimuthal anisotropy to your benefit. Classic analysis of azimuthal anisotropy requires seismic reflectors, that is, your reservoir is within a sedimentary rock sequence. Even when your reservoir is in fractured basement rocks, you will learn techniques that have been established through field data case histories to evaluate the reservoir, and guide the drilling program, using properly recorded and properly processed 3D reflection seismic data. Azimuthal anisotropy can be employed to your benefit if you have acquired the adequate and proper dataset in the field.
- Come to the class with the properly acquired and properly recorded dataset(s), your dataset can provide you with hands-on application of the principals of the lectures.

Course Content

- Fundamentals of seismology: body waves that travel through a solid medium; reflection, refraction, mode-conversion
- Fundamentals of seismic anisotropy. P-P multi-azimuth, P-S multi-azimuth, S-S multi-azimuth
- Fundamentals of 3D full-azimuth seismic data acquisition; issues of cost, number of channels, geophones chosen, recording system, fold, etc.; VSP acquisition; multicomponent acquisition
- Fundamentals of seismic data processing: P-P multi-azimuth, P-S multi-azimuth, S-S multi-azimuth; requirements for processing sequences; necessity to comprehend the (chosen) contractor's definition of 'azimuth' and checks throughout processing to determine if the contractor is adhering to its definition of azimuth
- Fundamentals of seismic data interpretation for fractured reservoir analysis, and in-situ stress evaluation; commercially available software needed for multi-azimuth and/or multi-component 3D seismic interpretation
- Fundamentals of seismic data modeling for anisotropy, common (different) assumptions within different modeling packages
- Commercially available support data: where to find it, how to integrate the required support data
- Additional topics by request

Product Details

Categories: Upstream

Disciplines: Geophysics

Levels: Specialized

Product Type: Course

Formats Available: In-Classroom

Instructors: PetroSkills Specialist Heloise Lynn