Thursday, October 21, 2004

Petroleum Club • 800 Bell (downtown) Social 11:15 a.m. • Luncheon 11:45 a.m. Cost: \$30 Pre-registered (see deadline below) members and affiliates

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by **Dr. Joel Walls** Rock Solid Images, Houston, Texas

Use of Well Logs in Seismic Reservoir Characterization

Seismic reservoir characterization, also known as reservoir geophysics, has evolved over the past several years into a multi-disciplinary, business-critical function in most ED&P

organizations. Sheriff defines reservoir geophysics as "The use of geophysical methods to assist in delineating or describing a reservoir or monitoring the changes in a reservoir as it is produced." Reservoir geophysics is applied across a wide spectrum of the oilfield life cycle from discovery and early development to tertiary recovery. One critical part of this process is careful analysis and understanding of petrophysical properties from well logs and core data (seismic petrophysics).

This presentation will illustrate why

seismic petrophysics is so important and will show how carefully constructed synthetic models can help the geoscientist interpret acoustic and elastic impedance inversion from seismic data.

Seismic petrophysics can be performed on single or multiple wells and consists of the following basic steps.

Geophysical Well Log Analysis (GWLA)

• Collect and organize input data, reservoir conditions, and fluid properties

- The principal benefits of seismic petrophysics are improved well-toseismic ties, improved calibration of seismic attributes to reservoir properties, and more reliable models of seismic response to reservoir changes.
- Perform geophysical log interpretation for volume minerals, porosity, and fluids over entire well
- Edit logs and perform mud filtrate invasion correction (as needed)
 - Generate missing curves (for example shear wave velocity)

Rock Physics Modeling and Perturbations

Perturb reservoir properties using rock physics effective medium models and compute new Vp, Vs and density curves.

- Fluid Saturation
- Porosity
- Lithology
- Net/gross

Synthetics

Compute synthetic seismic traces for in-situ and modeled conditions. May also include:

- AVO response
- Acoustic impedance (AI) and elastic impedance (EI)
- Other seismic attributes as needed

Examples show the effects of mud filtrate invasion effects, wellbore washouts and a bad Vshear log on seismic well tie. An example is also shown of how seismic **SIPES** *continued on page 29*



petrophysics can be used to interpret acoustic and elastic impedance inversions for oil saturation and porosity in an on-shore United States oil sand. The pricipal benefits of seismic petrophysics are improved well-to-seismic ties, improved calibration of seismic attributes to reservoir properties, and more reliable models of seismic response due to reservoir changes (vertically, laterally and temporally). These models can improve interpretation of 3D seismic data, especially acoustic and elastic impedance inversion. This improved interpretation can reduce drilling risk, enhance field productivity and ultimately increase asset value.

Note: This presentation is based on OTC paper 16921, May 2004.

Biographical Sketch

JOEL WALLS obtained his PhD in geophysics from Stanford University in 1983. He has been active in research and technical services related to core analysis, rock physics and seismic reservoir characterization. Dr. Walls founded PetroSoft Inc. in 1992 to bring rock physics technology to the desktop. Rock Solid Images (RSI) was founded in 1998 from the merger of PetroSoft Inc.,



Seismic Research Corp. and Discovery Bay. RSI has 30 employees in Houston and Oslo, Norway. Dr. Walls is Vice President of New Business Development.

