Sonic Waveform Analysis

In cooperation with several major oil companies and their research departments, Task Fronterra has developed new state of the art algorithms for sonic waveform processing and interpretation.

In contrast to the industry-standard “black-box” automated processing approach, we at Task Fronterra believe that in noisy data sets, interactive tracking in both frequency and time domain, and checking validity of individual receivers, is the only way to assure valid results.

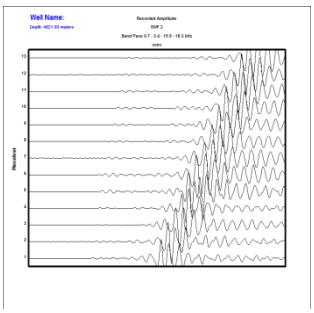
We have broken our workflow down into three main solutions:

- Slowness Analysis
- Anisotropy Analysis
- Stoneley Permeability Analysis

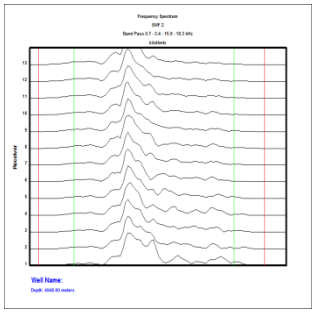
Waveform data can be computed and integrated with any other well data, including image and lithology analysis, petrophysical analysis, rock strength analysis, and completion analysis.

Slowness Analysis

With the ability to process and analyze the majority of acoustic tools from the major service companies, Task Fronterra computes acoustic slowness from both monopole and dipole sources.



Detailed Amplitude



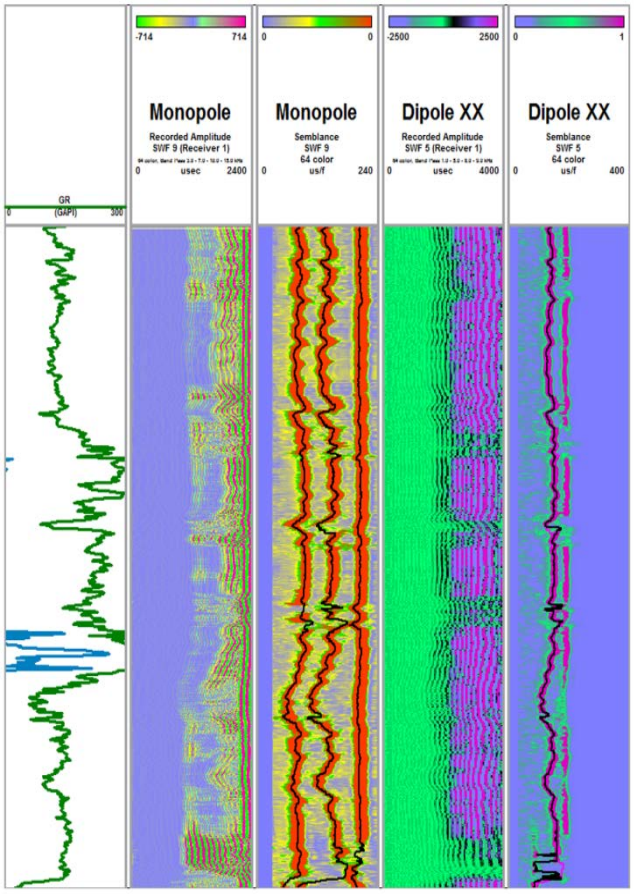
Frequency Spectrum

The slowness derived from the acoustic data includes the following:

- Compressional Wave Slowness
- Monopole Shear Wave Slowness
- Stoneley Wave Slowness
- Dipole Shear Wave Slowness

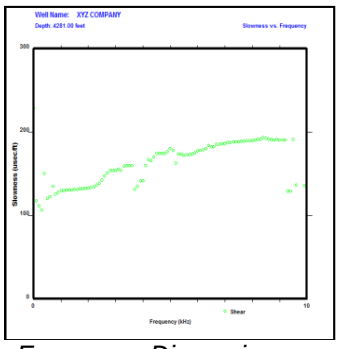
The results of this process can be used in the following ways:

- Support and calibration of seismic data
- Seismic AVO
- Fracture identification
- Computation of porosity
- Rock strength and Geomechanics calculations
- Stratigraphic correlation
- Lithology identification
- Facies recognition
- Identification of high compaction zones
- Identification of over-pressured zones

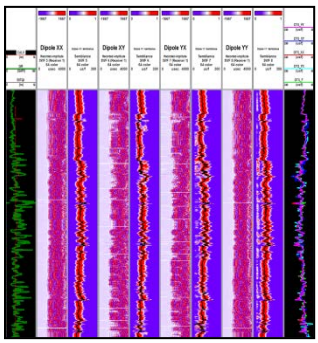


Anisotropy Analysis

The computation of anisotropy from cross-dipole data can yield several key inputs into the final analysis of the well and the well completion design, as well as for field development planning.



Frequency Dispersion



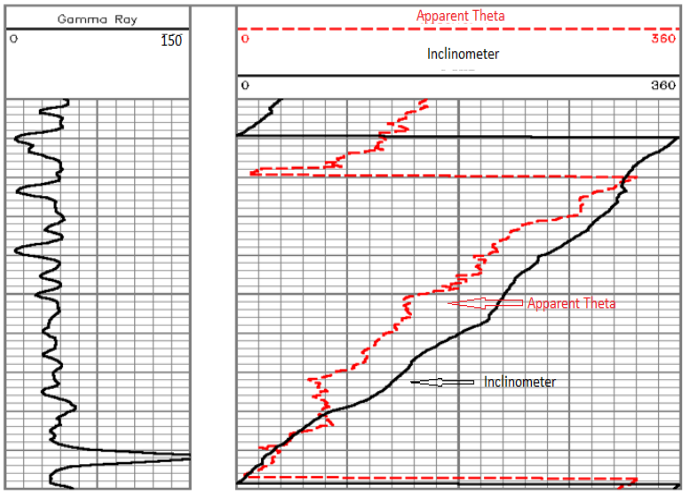
Slowness for all Axes

Anisotropy determination and measurement is derived from two analytical steps.

- The computation of a fast shear azimuth
- The computation of fast and slow shear slowness and anisotropy index

Step 1: The fast shear azimuth is determined by taking four co-planar receiver arrays from the cross-dipole data and using them to find apparent fast shear azimuth.

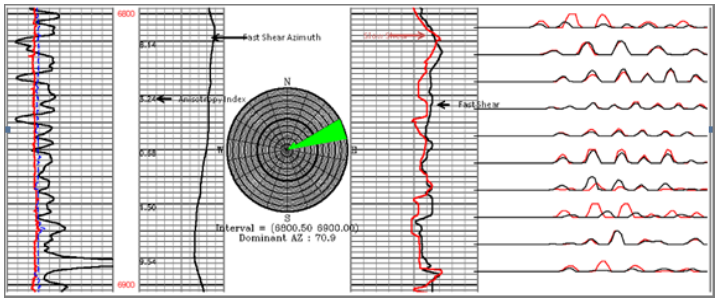
Step 2: The derived apparent fast shear azimuth data is then combined with inclinometer data, and rotated to yield true fast shear azimuth.



Apparent Theta and Inclinometer

In an anisotropic medium, apparent theta and inclinometer reading show strong parralellism

This process results in a fast and slow shear slowness, which is used to identify anisotropy and maximum and minimum horizontal stress direction around the well.

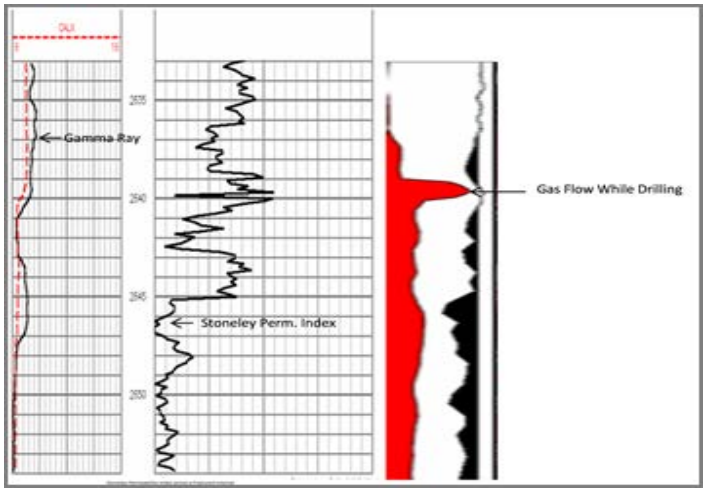


The resulting analysis can be used for:

- Determination of in-situ stress directions
- Hydraulic fracturing design and fracture propagation prediction
- Wellbore stability analysis
- Sand production prediction

Stoneley Permeability Analysis

Stoneley waves are coherent pseudo-Raleigh waves. At low frequencies the attenuation of these waves can be correlated to wellbore or formation permeability. This correlation is a permeability index. This index is then correlated to open fractures, mud logs or to other petrophysical data to identify and qualify zones of possible productivity.



Task Fronterra Geoscience is a global independent provider of industry leading, integrated geoscience solutions, from single well analysis to complete reservoir studies.