

What is the cost of a Passive Seismic Tomography (PST) survey?

The average cost to perform a 3D PST survey is a fraction of the cost of conventional 2D seismic and is not dependent on topography. It is of the order of 2 \$M per 1000Km² but for larger areas it can drop down to \$600K/1000Km²

What are the deliverables of a PST survey?

3D V_p, V_s and Poisson's ratio volumes, which can be cut off in vertical and horizontal sections at any required spacing. Structural and lithological information. Indication of regions of hydrocarbon potential. Walking through the 3D structure below the entire block Video.

Is your region appropriate for a PST survey?

LandTech's PST method uses very small microearthquakes (even negative magnitudes) which occur almost everywhere. Prior to a PST survey, LandTech's engineers will make a fusibility test to assess the background seismicity.

Are PST results less accurate than those from conventional seismic?

In many cases where we encounter seismic penetration problems, rough topography or acoustic barriers, PST results are even better.

How long does it take for a PST survey?

For a region with medium seismicity we need 6-8 months.

How can we be sure about the accuracy of the results?

LandTech performs a series of QC tests which encounter synthetic and inverse modeling to proof the accuracy of the PST deliverables. We have crosschecked PST results in locations where data from VSP exist and they differ less than 5%!

Can we perform a PST survey in a region encountering very high elevation variations?

Yes! PST is the only method which is not dependent on topography. We do not have to layout seismic lines and prepare shot points. All we need is a network of isolated seismographs at a spacing of about 2-5Km and we leave nature to do the shots!

Do you use common seismographs?

No! LandTech is the only company which has designed and manufactures digitizers and seismometers specially adapted for PST surveys. All our competitors buy off the self conventional seismographs which are not so sensitive.

Can we apply PST in areas where we have very low resolution conventional seismic sections in order to improve them?

Yes! Many of our customers have used our accurate 3D passive seismic velocity model to reprocess their seismic sections (PSDM) and reveal hidden targets.

Can we differentiate oil and gas reservoir with PST?

One of our deliverables is 3D Poisson's ratio. It is well known that V_p/V_s values are much lower (10-20%) for gas saturation than for liquid saturation. Thus, in certain cases PST results can be used for such an interpretation.

Can we combine PST with Gravity and MT?

LandTech has developed a special algorithm for the joint inversion of PST, Gravity and MT data.

Can you operate offshore?

LandTech has developed an offshore version of its LTSR24 recorder and seismometer which can operate up to depths of 10Km.

What about the case that the recorded microearthquakes originate from certain isolated faults?

In this case we rearrange the geometry of the recording stations to increase the average seismic ray density coverage of the block.

Do all microearthquakes have to occur within the block to be investigated?

We usually install 10% of the stations out of the survey area in order to locate and the nearby microearthquakes. Usually the seismic rays from these microearthquakes are recorded with low angles of incidence and can increase the seismic ray density and hence the resolution at low depths.

How many microearthquakes we need for getting sufficient resolution?

Lets suppose that we have installed a network of 50 three-component seismographs. On average, in a tectonically active area we usually record 5-10 microearthquakes per day. If we record 5 events in 60% of the installed seismographs (that is we can detect seismic phases at 30 stations) we obtain $5 \times 3 \times 30 = 450$ seismic rays per day or 80,000 rays for a 6 month recording period, crossing our target!

What about environmentally protected areas?

LandTech's PST methodology is ideal for these cases. It is the only seismic technique with no environmental impact. We have successfully installed passive networks in extremely environmentally sensitive regions such as in the Amazon's tropical forest, swamps and national parks.

Can PST methodology be used for reservoir monitoring?

One serious problem in reservoir monitoring using only borehole sensors is the low location accuracy obtained due to the bad geometry of the borehole seismic sensors (insufficient detectability) the inaccurate 3D velocity model and the high cost. LandTech has developed special ultra sensitive surface sensors with embedded microprocessors which determine in real time the arrival of P- and S- phases and transmit the data via VHF to central unit which plots the seismicity induced cloud. Furthermore, via advanced Wi Fly (better than Wi Fi) technology the seismic sensors can even transmit full wave forms to the central processor for determining various seismological parameters such as seismic moments. Visit our dedicated web site for Shale Fracking at <http://www.landtech-geophysics.com>.

Can we apply PST methodology in regions of high industrial or natural noise?

LandTech uses special noise reduction (Winner and Kalman) filters which can reveal the arriving seismic signals at the recording stations out of the background noise.

Is any relation between the so called Low Frequency Passive Seismic (LFP) method (or sometimes called Direct hydrocarbon indication) and LandTech's Passive Seismic Tomography (PST) method?

Not at all!! Some companies state that a natural low frequency can be detected upon a reservoir. LandTech's engineers and other researchers have thoroughly experimented on this methodology AND FOUND NO INDICATION of the existence of such a frequency, thus LandTech does not deliver this kind of services.

NOTE: LANDTECH HAS NO RELATION WITH SEISMOTECH A COMPANY PROVIDING SIMILAR SERVICES!!!

When the Earth whispers we are there

www.landtechsa.com

