

Micro-Seismic Data Acquisition

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Summary

What is Passive seismic? Passive seismic involves the mapping and monitoring of subsurface events without the use of conventional seismic sources such as Vibroseis and Dynamite (Land) and Airguns (Marine).

Micro-seismic refers to small scale sound waves created by natural events created by geological processes such as rock fracturing and resulting rock slippage, fluid migration within rock pore spaces and by manmade events such as hydraulic fracturing during reservoir stimulation and hydrocarbon extraction and water or CO₂ injection.

The purpose of the micro-seismic data acquisition includes understanding characteristics of oil and gas reservoirs, reservoir monitoring during the hydrocarbon extraction process and increasing reservoir development as well as monitoring reservoir behavior after the fracturing process meant to stimulate a reservoir.

The data recording is in real time and the recording duration can be short-term or long-term. The field equipment can be single component or multi-component receiver arrays which may be deployed on the surface or be buried. The recording instruments are similar to those used in surface seismic operations. Micro-seismic arrays are deployed at larger spacings such as 1 – 3 km as opposed to surface seismic arrays which have a much denser spacing such as 25 m. Recent innovations such as MEMS (micro-electro-mechanical-systems) technology of Input/Output may be required to fully realize the potential of microseismic data.

The main advantages in using micro-seismic data is the reduction in cost due to not using seismic sources such as Dynamite, Vibroseis and Airguns, the reduced crew costs and reduced environmental considerations in not deploying heavy equipment such as Vibrator trucks as well as complimenting existing surface seismic data.

Field equipment layout of micro-seismic data acquisition will be illustrated.