

## Seismic Monitoring System using Optical Fiber and DAS (Distributed Acoustic Sensing) Technology

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DAS (Distributed Acoustic Sensing) technology has been introduced more than 5 years ago for the demands of pipeline monitoring and intrusion detection in Oil & Gas business. The latest optical fiber sensing technology using 'Phase' data now allows DAS to record Seismic signal including VSP (Vertical Seismic Profiling). The system is called 'hDVS' (heterodyne Distributed Vibration Sensing) in order to distinguish from pipeline monitoring system.

Unlike conventional seismic recording system, which usually use electro-magnetic sensor or Geophone, hDVS/DAS uses optical fiber as vibration sensor. It measures dynamic strain of the optical fiber, either SMF (Single-Mode Fiber) or MMF (Multi-Mode Fiber) for entire length or the section defined by the system. In case of SMF, the maximum length of the optical fiber is around 50km with current system, while the maximum length is reduced to around 10km for MMF, depending on the level of optical signal loss and optical sampling frequency. We are currently developing new system, which would be able to record over 50km length of SMF (100km is theoretical maximum length for hDVS/DAS).

There are several advantages of hDVS/DAS system compare with current seismic monitoring system such as:

- a) Able to use existing optical fiber installations as seismic sensor instantly.
- b) One system can measure line sensor as long as 50km rather than dot sensor.
- c) Easier to expand as monitoring network by using existing optical fiber network.
- d) Spatial resolution and gauge length can be set as parameters.
- e) Core part of optical fiber is made of high-silica glass which can be installed at harsh environment over 200 degC where conventional sensors cannot be used.
- f) Optical fiber is a passive component and no high risk of failure.

There would be more benefits can be identified.

During the presentation, mechanism of hDVS/DAS system will be explained followed by examples of seismic data recorded during Field trials last few years.

Keywords: DAS, hDVS, Optical Fiber, Laser, Seismic Monitoring