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Borehole seismic survey using multimode optical fibers in a hybrid wireline

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Highlights

- DAS uses optical fiber cable as distributed sensors for borehole seismic signals
- DAS is a viable alternative to downhole geophone arrays for borehole seismic survey
- It can dramatically reduce operating time required for a borehole seismic survey
- It can achieve much higher spatial coverage than is typical of current technologies
- Optical cable for borehole seismic survey will open DAS to much wider applications

Abstract

Distributed Fiber Optic Sensing is increasingly recognized as a viable alternative to geophone arrays for the acquisition of borehole seismic data. The ability to deploy optical fibers into a well, either as a cable based intervention or as part of a completion string, allows for the entire wellbore to be surveyed with every source activation. This can dramatically reduce the operating time required to complete a normal survey as well as offering the opportunity to achieve much higher spatial coverage than is typical of current technologies. The ability to acquire borehole seismic data in a producing well without the need to disrupt production also offers significant benefits to the operator.

Distributed acoustic sensing (DAS) is a novel technology that uses an optical fiber cable as a sensor for acoustic signals and can take almost any downhole fiber-optic installation or deployment and turn the fiber optic cable into a large downhole seismic array. This array can provide enhanced Vertical Seismic Profile (VSP) imaging and monitor fluids and pressures changes in the hydrocarbon production reservoir. Walkaway VSP data acquired over a former producing well in north eastern China provided a rich set of very high quality DAS

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