

## **Is it time for vertical seismic profiles to become part of every logging run?**

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### **ABSTRACT**

Although undoubtedly of value, the acquisition of vertical seismic profiles (VSPs) is often cancelled or curtailed due to the time required to record them. This is predominantly due to the limited number of downhole recording shuttles currently available, requiring the shuttles to be deployed at multiple depths in the well. The development of new, fibre-optic based, VSP acquisition systems now offers the chance to overcome these limitations. Instead of employing individual recording shuttles, these systems utilise a fibre-optic cable contained within the wireline cable as the sensor. A laser interrogation system located on the surface and connected to the cable is then used to detect any vibrations. As the entire fibre is used as a distributed sensor data from the full depth range of the well can be recorded simultaneously with spatial resolution of the order of tens of centimetres. As conventional tools can be deployed at the end of the cable as per a standard logging run a VSP can be acquired as part of any job without any significant additional time cost. Fibre optic cables permanently installed in wells can also be used for VSP acquisition without the need for any form of well intervention, simply requiring the presence of a source and an interrogation unit.

Although the quality of data acquired using fibre-optic systems is generally inferior to conventional, sensor-based systems it is sufficient to determine the time-depth relationship. More advanced processing products may also be possible, particularly if a permanently installed fibre is being used as its coupling to the formation will be superior when compared with a wireline deployment.

The introduction of fibre-optic VSP acquisition systems clearly offers the ability to overcome the issues associated with the time, and therefore cost, required for VSP acquisition. The ease with which data can be acquired should help VSP acquisition evolve from being a niche application applied to a very limited number of wells to becoming a standard part of most jobs.

In this paper we describe the technology involved and give an overview of its operation. We then present a variety of results from different surveys before giving an overview of the implications of this exciting new technology, both for VSPs and other applications.