

Intelligent Distributed Acoustic Sensor for Wellbore Surveillance

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Abstract

The intelligent Distributed Acoustic Sensor (iDAS) uniquely allows the simultaneous recording of acoustic energy along many kilometers of optical fiber deployed along a wellbore.

The system uses a novel digital optoelectronics detection technique that captures the amplitude and phase of the acoustic waves generated and propagated over a wide frequency (1mHz – 100kHz) range with a high dynamic range (>120dB). A number of signal processing techniques have been developed for processing a large array of acoustic data that can be recorded through the life of well for a number of surveillance applications. These include flow imaging, borehole seismic profiling and wellbore integrity monitoring.

The acoustic signal spectrum can be used to monitor the inflow along the wellbore and/ or through the inflow control valve devices (ICV). Using a frequency-space array processing (f-k) the speed of sound propagating through the fluid may be measured to determine the fluid composition. In addition, the flow rate may be determined by calculating the Doppler shift of the speed of sound induced by the fluid flow.

The iDAS system can also be retrofitted with both existing single-mode and multimode optical fibers. The presentation will give some examples of the wellbore surveillance applications using iDAS.