

## Reservoir Monitoring Using Permanent in-Well Seismic

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We look at the benefits of placing permanent seismic sensors in a wellbore and recording data over time, either passively or with dedicated surface sources. Implementation involves placing an array of sensors permanently in a well along with the completion string. Challenges include recording data over fluid-flow noise in the well (production or injection) and reliability of the sensors and associated hardware. Applications include 4-D imaging and monitoring of reservoir properties, both stand-alone and in conjunction with surface seismic, and mapping of faults and other features using micro-seismic events. Recently, a fibre-optic based system has been created for permanent emplacement in wellbores. This system has been tested with two field trials and 2006 plans are in place for production well installations. In addition flow noise tests in a test well examines the system for de-coupling the sensors from the tubing and borehole noise and demonstrates how the system can record data during production of a well.