

Long Term Distributed Strain Monitoring of a SAGD Reservoir

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Abstract

Excessive mechanical deformation of the reservoir and overburden during thermally enhanced recovery operations can lead to costly damage to completions, surface facilities, and the environment. Direct measurements of how subsurface strain is distributed over well depth can help improve operators abilities to realistically predict subsurface deformations and properly account for operating risks.

We present a case study of insights gained from several strain monitoring wells in a thermally produced SAGD reservoir where data was collected periodically over a period of five years. The strain monitoring data was collected using optical frequency domain reflectometry (OFDR) interrogation of high spatial density Bragg grating fibers. The fibers are conveyed within cables designed to transmit external cable strains directly to the internal fibers.

In addition to the expected strains associated with steam chamber formation, deformation is also observed within the caprock and some of the overburden formations. The operator is using the measurements to calibrate mechanical earth models and better understand the response of the lithology to thermal operations. The monitoring technology as well as results and insights from this long term monitoring project will be presented.