Time to Depth Conversion and Uncertainty Characterization for SAGD Base of Pay in the McMurray Formation

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Abstract

The Athabasca Oil Sands of northern Alberta are a source of vast amounts of bitumen, estimated at approximately 1.7 trillion barrels. In-situ technologies, primarily Steam-Assisted-Gravity-Drainage (SAGD), are economically viable recovery schemes for almost two thirds of these enormous resources. A key aspect of deployment of SAGD as the recovery technique is proper horizontal well placement. A very important factor in a successful horizontal well placement is accurate detection of the SAGD base of pay surface and quantification of the associated uncertainty of the reservoir conformance. In this study, the target reservoir is characterized by stacked fluvio-estuarine channels of clean sand deposited within an overall transgressive system tract, where the SAGD base of pay is often characterized by either the Devonian or the so-called "middle McMurray" composite incision surface. The primary source of data to identify the SAGD base of pay are the well tops, while seismic data that are picked in the time domain are often treated as a soft secondary source of information. The focus in this study is to apply geostatistical tools to model the SAGD base of pay by using (1) well tops only, (2) well tops and seismic patches that are often available in the first pass and prior to picking of the full surface in the time domain, and (3) well tops and the fully picked seismic surface. For this purpose, geostatistical techniques such as Ordinary Kriging (OK), Kriging with Error (KERR) and Kriging with External Drift (KED) are applied, and the calculation of a linear velocity model is exercised. The results show the range and structure of spatial correlation of error and its associated anisotropy, as well as the value of seismic data integration in reduction of uncertainty in the modeling of SAGD base of pay.