

Vp/Vs – A novel approach for interpreting McMurray Formation stratigraphic architecture with cores, logs and seismic data

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Summary

Geological studies on ancient and modern tidal-influenced fluvial deposits can differentiate between the three lithofacies (sand, sand IHS and mud IHS) that are associated with the complex stratigraphic architecture elements such as point bars, counter point bars, and channels (abandoned and/or sandstone-filled).

This paper will show how we have integrated cores, wells and seismic data to better interpret stratigraphic architecture elements in the Lower Cretaceous McMurray Formation of the Athabasca basin.

Firstly, we will investigate the effect of core grain size and texture on the VpVs ratio estimated from wireline logs available for several McMurray Formation oil sands reservoirs. Grain size along with reservoir thickness, porosity, permeability is a key factor that affects steam chamber growth in the current-preferred extraction process of Steam Assisted Gravity Drainage (SAGD).

Secondly, we will add structural and stratigraphic seismic attributes derived from high-quality three-dimensional (3-D) seismic data, and investigate the variation of VpVs ratio in each of the above mentioned lithofacies. P- and S-wave velocities along with density are used in quantitative seismic interpretation when rock physics is applied for reservoir characterization, based on lithologies and pore fluids, from seismically derived attributes.

Our findings help in understanding the stratigraphic architecture elements that are crucial for pad locations optimization, horizontal wells placement, and well pair performance.