GeoConvention 2015
GEOSCIENCE
new horizons
Telus Convention Centre • 4-8 May 2015 • Calgary, AB Canada

Issue Paper: Aquifer Integrity under the Influence of Thermal Extraction of Bitumen and Heavy Oil

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Summary

The impact of underground effects triggered by thermal recovery of bitumen and heavy oils on aquifer integrity has yet to be addressed. Aquifer integrity can be defined as the physical and hydrodynamic setting for which safe groundwater storage and sustainable delivery of water quantity and quality is preserved. Like cap-rock, aquifer integrity under the influence of thermal extraction is expected to deteriorate due to Underground Thermal Effects (UTE), caused by geomechanical modification of the stress path at the reservoir level. Most popular thermal recovery methods causing UTE are Steam Assisted Gravity Drainage (SAGD), Cyclic Steam Stimulation (CSS) and Steam Flooding (SF). UTE associated with other forms of thermal recovery approaches such as in-situ combustion (ISC) have been less studied and might differ in nature and magnitude from the steam-based ones. Despite the fact, similar UTE are expected. This issue paper addresses the role of UTE on aquifer integrity under the influence of thermal extraction as identified for cap-rock integrity in the bitumen and heavy oil industry. Main UTE are heave, fracturing, lessen of well integrity and heat plume development, which develop or enhance underground process that ultimately impact aquitards and aquifer integrity. Such processes are gas migration, cross formational flow, interwellbore communication and element mobilization. Although impacts of UTE on caprock and reservoir integrity are well known to the bitumen and heavy oil industry, the same on aquifer and aquitard are less understood. This paper was originally prepared and presented at the SPE Heavy and Extra Heavy Oil Conference - Latin America held in Medellin, Colombia, 24–26 September 2014, Paper SPE 171048-MS

References

Rivera, L.E. Aquifer Integrity under the Influence of Thermal Extraction of Bitumen and Heavy Oil, SPE Heavy and Extra Heavy Oil Conference - Latin America held in Medellin, Colombia, 24–26 September 2014, Paper SPE 171048-MS