

Preliminary Assessment of Reservoir Damage by Asphaltene Precipitation and Migration in Producing Montney

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Summary

The Waskahigan Montney oil pool is under-pressured (8 to 9 kpa/m) and interpreted to be within the pervasively hydrocarbon saturated fairway at the updip leading edge of the Montney Deep Basin. The pool was discovered in 2010 and the play now has 79 horizontal multi-frac wells. Completions within the play have evolved in recent years from low proppant intensity (0.1-0.2 T/m) oil-based completions to higher intensity (0.6-1.5 T/m) slickwater completions. Recent laboratory analyses reveal the presence of asphaltenes that may be creating wellbore damage.

Theory / Method / Workflow

Intensive rock and fluid studies began in early 2019 with Marc Bustin of UBC, and included Dean Stark measurements, stressed permeability, wettability, surface tension, interfacial tension, capillary pressure, and relative permeability tests. Limited previous relative permeability data from the area indicated the rock should be water-wet. New relative permeability laboratory analyses were completed at reservoir temperature and pressures, injecting produced formation fluids (oil and water) through Waskahigan Montney reservoir rock.

Results, Observations, Conclusions

Examination of tested specimens demonstrate a build up of a cake on the plug faces comprised in part of asphaltenes which results in a progressive and dramatic loss of permeability to oil with test duration.

Subsequent SARA analyses of the produced oil show the presence of significant asphaltenes (0.45% by weight) that are not otherwise apparent in the produced fluids.

Montney wellbores in the area have measured corrected present-day bottom hole temperatures in the range of 76-85 degrees Celsius. The Montney Formation in the area has very low total organic content (TOC <1%) and the oil is not considered self sourced in situ. We thus speculate that asphaltenes would be associated with the migrated oil phase into the Montney at Waskahigan.



Novel/Additive Information

It is possible that the Montney formation elsewhere in the basin has an asphaltene component that might be dropping/filtering out at the wellbore face within specific pressure/temperature conditions and creating systemic skin damage that is not detected.