Title of article: Performance of High Paraffin Reservoir under Non-Isothermal Waterflooding

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Abstract

This study analyzes the performance of a high paraffin reservoir under cold waterflooding for 17 years using a 3-D finite difference simulator and analytical solution of injection wellbore temperature profile to upgrade reservoir management strategies. The reservoir has been marked by injectivity issues, early injection rate decline by half initial values and low incremental recovery, hence subject to alternate developmental schemes. Reservoir model used water saturation calibrated with core derived values and permeability computed from the flow zone concept by Bayesian inference with mutually exclusive multiple well-logs approach. The influence of cold waterflooding is assessed from simulated temperature maps due to non-isothermal injection and solution of injection well temperature profile. As well as predicting reservoir performance. Furthermore, comparison of sub-divided reservoir into North and South fault blocks provided added analysis. The results of coarse grid temperature distribution shows higher temperature decline away from the injection wells for the South Fault Block than the North Fault Block. Fine grid temperature distribution presents maximum radial distance of paraffin precipitation occurrence window is 25-30m at maximum history injection rate. This is further linked to the non-Newtonian flow effect accounted for by higher than normal predicted production rates specifically for the South Fault Block. Optimal injection temperature with rate was obtained to avoid the cloud point temperature window. And, recovery was maximized for the North Fault Block by reducing waterflood pattern and conversion of production well into injection well with status quo cold waterflooding.