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Simulation of the Asphaltene Deposition Rate in a Wellbore Blockage via Computational Fluid Dynamic

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Abstract : There has been lots of published work focused on asphaltene deposited on the smooth pipe under steady conditions, while particle deposition on the blockage wellbores under transient conditions has not been well elucidated. This work attempts to predict the deposition rate of asphaltene particles in blockage tube through CFD simulation. The Euler-Lagrange equation has been applied during the flow of crude oil and asphaltene particles. The net gravitational force, virtual mass, pressure gradient, saffman lift, and drag forces are incorporated in the simulations process. Validation of CFD simulation results is compared to the benchmark experiments from the previous literature. Furthermore, the effect of blockage location, blockage length, and blockage thickness on deposition rate are also analyzed. The simulation results indicate that the maximum deposition rate of asphaltene occurs in the blocked tube section, and the greater the deposition thickness, the greater the deposition rate. Moreover, the deposition amount and maximum deposition rate along the length of the tube have the same trend. Results of this study are in the ability to better understand the deposition of asphaltene particles in production and help achieve to deal with the asphaltene challenges.

Keywords : asphaltene deposition rate, blockage length, blockage thickness, blockage diameter, transient condition
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