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Modelling Minimum Flow Rate Required for Unloading Liquid in Gas Wells

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Abstract

Liquid loading in gas well has been an interest in the Oil and Gas sector due to the reduction of ultimate recovery and also the reduction of production from such wells. Several authors have presented various models for predicting the beginning of liquid loading in a gas well, yet there are regular errors in the model outcomes. Turner et al. based his critical model on a presumption that liquid droplet is spherical and stays that way throughout the wellbore. Li's model developed later on based on his postulation that droplets are flat in shape and stays that way throughout the wellbore. In reality, when producing in a gas well, under pressure variation, the liquid droplets alternate between sphere-shape and flat shape. Hence there is a need to incorporate the liquid droplet deformation coefficient in the liquid loading governing equation. The newly presented model considered deformation coefficient to justify irregular changes in liquid droplet due to pressure variation during the simultaneous flow of gas and liquid droplet in gas wells, therefore, predict the critical flowrate correctly as the droplet fluctuates between spherical and flat shape. The results from the newly developed model of the critical flowrate using test data provided by Coleman et al. show that the modified critical flowrate is closer to the test flow rate than the other existing models as the error obtained is -9.12688%.

Keywords:
reservoir surveillance, droplet, coleman, droplet shape, artificial lift system, gas well deliquification, critical flowrate, prediction, liquid droplet, production monitoring
Subjects:
Artificial Lift Systems, Well & Reservoir Surveillance and Monitoring, Formation Evaluation & Management, Gas well deliquification