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Water Coning from Simulation to Neural Network - Comprehensive Study of Coning Prediction and Factors Affecting It

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Producing undesirable phases like water and free gas in oil wells is a challenging problem in the oil industry. The main major reason for that problem is water coning. Coning is a rate-sensitive phenomenon generally associated with high producing rates. Strictly, a near-wellbore phenomenon, it only develops once the pressure forces drawing fluids toward the wellbore overcome the natural buoyancy forces that segregate gas and water from oil. This study implementing Nexus simulation to build different mechanistic model with different parameters known in literature that affecting water coning formation in oil reservoirs. Simulating water coning is a very challenging problem due to the instabilities of solvers due to severe saturation change around wellbore unless small time steps and small grid sizes were used. Local Grid Refinement "LGR" is used to accurate follow-up water conning formation and minimize solver convergent error appears. The enormous numbers of simulation runs were used to quantify the effect of every parameter on the progress of water to form conning around wellbore. Neural Network was built using the input and output parameters from the simulation runs to have a simple approach of calculation critical rate of production and how the uncertainty in every parameter would affect the recovery and coning formation.