Studying the Combined Effect of Wellbore Storage and Skin on Well Testing Using Simulation and Analytical Solutions

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Abstract

Well testing is an important tool for reservoir evaluation and characterization. The goals of a well test are to obtain sufficient data to meet the stated objectives and to accomplish these tasks in a less time and inexpensive manner. For that, designing of a test plan is too important before starting that test. Reservoir simulation is widely used to solve research problems as well as actual field problems. This is due to the limitation of analytical solutions to deal with the heterogeneity of the reservoirs and non-linearity of the diffusivity equations (i.e., for gases, properties changing with pressure). Another reason is its ability to be used in predictive methods for reservoir management purposes. This paper discusses the design of well testing models using conventional reservoir simulator, GASSIM, to simulate the combined effect of wellbore storage and skin. Both oil and gas cases, with radial and areal grids are designed. The simulated pressure-transient behavior model results matched well the analytical solutions (having the same wellbore storage and skin parameters within a well test software) which illustrate its accuracy. These models are used to study the effect of wellbore storage and skin on a pressure-transient test. The results illustrate its agreement with any actual reservoir behavior, so its ability to be used, without the need to modify the simulator, in simulating and designing pressure-transient tests.

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