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TRANSIENT PRESSURE ANALYSIS FOR VERTICAL WELLS WITH SPHERICAL POWER-LAW FLOW
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Abstract

Heavy oil is considered nowadays as one of the unconventional reservoirs of main interest in the oil industry. Some ofthem display non-Newtonian pseudoplastic behaviorwhich mathematical modeling dfffers from the conventional case and, therefore, the flow regimes display some particular behaviors . Fracturing fluids, foams, some fluids for Enhanced Oil Recovery (EOR) and drilling muds can also fall into this category. The spherical/hemispherical flow mainly caused by partial completion/penetration deserves a particular treatment for pseudoplastic f1ow. A single research for this case was found in the literature to introduce only its mathematical model. The pressure and pressure derivative behavior of spherical/hemispherical flow behavior of a slightly compressible, non-Newtonian power-Iaw fluid (pseudoplastic) is studied in this work and conventional and Tiab's Direct Synthesis (TOS) methodologies are extended for well test interpretation purposes. For pseudoplastic spherical/ hemispherical flow, the slope of the pressure derivative is no longer -1/2, besides it changes with the value of flow behavior index n, which indicates that the interpretation of pressure data for the dealt systems through the use of traditional methods should not be accurate. New Equations are introduced to estimate spherical/ hemispherical permeability and spherical/hemispherical skin factor for the systems under consideration. The Equations were successfully verified by its application to synthetic cases.

Keywords

Pseudoplastic fluid, Consístency Power-Iaw, Radial flow, Partial completion, Partial penetration, Well tests, Transient pressure.