Contribution ID: **277** Type: **Poster (+) Presentation**

Permeability Decay Evaluation for a Nonlinear Oil flow through Porous Media in a Wellbore Near a Sealing Fault through Green's Functions (GF's)

Tuesday, 1 June 2021 19:00 (1 hour)

Nonlinear oil flow through porous media near a sealing fault has a key role in reservoir engineering because the existence of sealed zones in many types of reservoir rocks present in the world. This work proposes a new unsteady 2-D permeability pore pressure-dependent model for a wellbore near a sealing fault, where analytical solution is based on an integro-differential solution of the Nonlinear Hydraulic Diffusivity Equation (NHDE) through Green's Functions (GF's). The model also considers the variation in the properties of the rock and the fluid present inside its pores. The unsteady 2-D pressure field is described by the sum of two exponential integral functions Ei(xD, yD, tD), that constitute a combined flow (radial, near to the wellbore) and linear (near to the sealing fault). This type of flow in geosciences and petroleum engineering literature is known as pseudo-radial flow. Authors also implement the new model in Matlab® software in order to evaluate the general solution, so as initial and boundary conditions. The model calibration is performed through a porous media oil flow simulator, which showed a high convergence. The permeability functions for some types of reservoir rock are obtained through laboratory correlations, generated from synthetic field data. Authors conclude that general solution of NHDE is given by the sum of line-source solution PwD(tD) and the first order term of the series asymptotic expansion, mwD(1)(tD). This second term of the series expansion is obtained by solving a Volterra's second kind integro-differential equation in Matlab and is responsible for all the nonlinearities of the combined oil flow. Results of this research showed that when the fault presence begins to contribute to the pressure drop at the well, the drawdown data increasingly departs from the semilog straight line. After a long transitional period, a second straight line with slope 2m can be noticed. Authors also realized that the pressure graphs showed excellent agreement when compared to a numerical simulator and presented errors less than 0.5%.

Time Block Preference

Time Block C (18:00-21:00 CET)

References

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