ABSTRACT

PRESSURE DISTRIBUTIONS FOR WELLS LOCATED IN VARIOUS, BOUNDED, ANISOTROPIC RESERVOIRS

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The literature presents several studies on pressure distributions in various bounded systems. However, in most cases the computational procedures are tedious and results limited to particular well locations in isotropic reservoirs. In this thesis, a comprehensive analysis of the effects of anisotropy is presented, extending the list of pressure distribution data available in the literature.

Pressure distributions for a wide range of well locations and bounded reservoirs in anisotropic systems were generated by adapting Larsen's algorithms for isotropic systems to anisotropic conditions. This involved the use of suitable transforms to model the effect of permeability variations in two major horizontal axes of flow on the final pressure distribution.

The results, which are computer-generated, are presented in both graphical and tabular form. They include the Matthews-Brons-Hazebroek (MBH) pressure function, shape factor (C_a), the dimensionless wellbore pressure function (P_{wd}) and the Miller-Dyes-Hutchinson (MDH) pressure function.

It was concluded that the extent to which directional permeability variations influenced the dimensionless results was subject to the particular well/reservoir characteristics. Highly symmetrical systems and well locations generally showed a lowering of the correction functions for increasing values of anisotropy. Whereas, highly asymmetrical figures and well positions show an increased correction function for larger directional permeability differences.

Application of the results generated in this work is encouraged, especially where directional permeability is evident. Computer programs are presented for computing the abovementioned pressure functions on well locations and reservoir configurations other than those specifically covered. Further research is recommended in quantifying the effect of anisotropy on pressure distributions under constant pressure outer boundary conditions and for multi-well reservoirs.