

PDF - A-THREE DIMENSIONAL NUMERICAL SIMULATOR FOR EXPANSION-DRIVE RESERVOIRS -  
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Fluid flow in petroleum reservoirs (porous media) is very complex phenomena, and as such analytical solutions to mathematical models are only obtainable after making simplifying assumptions regarding reservoir geometry, properties and boundary conditions. However, simplifications of this nature are often invalid for most fluid flow problems and in many cases, it is impossible to develop analytical solutions for practical issues due to the complex behaviors of multiphase flow, nonlinearity of the governing equations, and the heterogeneity and irregular shape of a reservoir system. Due to these limitations in the use of analytical method, these models must be solved with numerical methods such as finite difference.

Reservoir simulation is one of the most effective tools for reservoir engineers that involves developing mathematical equations or computable procedure that are employed to understand the behaviour of the real reservoir (Darman, 1999).

Today, numerical reservoir simulation is regularly used as a valuable tool to help make investment decisions on major exploitation and development projects. These decisions include determining commerciality, optimizing field development plans and initiating secondary and enhanced oil recovery methods on major oil and gas projects. Proper planning is made possible by use of reservoir simulation; it can be used effectively in the early stages of development before the pool is placed on production so that unnecessary expenditures can be avoided.

When crude oil is discovered, in order to have proper understanding of reservoir behaviour and predict future performance, it is necessary to have knowledge of the driving mechanisms that control the behaviour of fluids within reservoirs. The overall performance of oil reservoirs is largely determined by the nature of the energy available for moving the oil to the wellbore. The recovery of hydrocarbons from an oil reservoir is commonly recognized to occur in several recovery stages. They are: Primary recovery, Secondary recovery, Tertiary recovery (Enhanced Oil Recovery, EOR), and Infill recovery.

Primary recovery is the recovery of hydrocarbons from the reservoir using the natural energy of the reservoir as a drive. The term refers to the production of hydrocarbons from a reservoir without the use of any process (such as fluid injection) to supplement the natural energy of the reservoir (Ahmed, 2006).

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