Abstract

Reservoir simulation is one of the most sophisticated available methods to perform reservoir management studies. Reservoir simulation, in an overall point of view, can provide essential data for reservoir economic forecasting and production chart. It seems that the term “reservoir simulation” will be in great attentions in future decades due to increment in using EOR processes. From mathematical point of view, simulation is to solve some partial and algebraic equations, contemporarily.

Green Element Method which was introduced at 1990 and is based on the singular integrals is selected for this thesis. In this method, an integral equation related to the original differential equation is formed by combining the free space green function and green second theorem. To solve the evolved integral equation, the entire of the domain is discretized (like finite element method) which is opposite of the boundary element method. And then, the primary variable and its derivate are approximated by interpolation function to form the element equations which is the most important part of green element solution.

The number of equations in the element equations is directly related to the number of nodes per element. In other hand, the number of equations in element equation is the same as the number of nodes in each element. The global matrix is formed by assembling the element equations and connectivity matrix. And finally, the global matrix can be solved by imposing boundary and initial conditions.

Our purpose in this work is to implement this method into the petroleum flow systems and to study the effect of various parameters on it. In each section, the green element results are compared with available analytical and experimental data. And finally the green element method ability to solve heterogeneity is another aim.

Key words: Reservoir Simulation, Green element method, Finite element method, Boundary element method