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The simulation of gas flow and transport in fractured shale reservoirs using finite element analyses and discrete fracture network model

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Naturally fractured shale reservoirs hold a significant amount of the word's hydrocarbon reserves. Discrete fracture network models (DFNMs) are newmodels for simulating fractured porous media (FPM) and have received considerable attention in the last decade. Flow behavior of fluids in different DFNMs has been studied by several researchers. But the DFNMs have not been widely used in the industry for filed-scale reservoir simulation studies because of the increased computational cost and time, even though they can explicitly accounting for the contribution of each individual fracture to fluid flow and the exchange between fracture and matrix than conventional methods.

In this paper, a new numerical method is introduced in the simulation of fluid flow in fractured shale reservoirs. The fluid flow behavior is investigated by solving the nonlinear partial differential equations,in which flow in fracture meets "Cubic law" and matrix meets "non-Darcy law", using the finite element analyses method. In the DFNM, fluid flow into the wellbore which are surrounded by impermeable rock matrix is only through fractures those connect to it. The model is validated and then used to simulate a random generated fractures network to study the characteristics of flow and transport in FPM. It is found that the fractures' connection and the number of fractures which connect to wellbore have a significant influence on the fluid migration, some other characteristic results along with appropriate analysis are presented through the numerical simulation.

Biography

Lidong Mi, born in 1987, is a doctoral student at the China University of Petroleum (Beijing). In 2011, he graduated from China University of Petroleum Beijing, and got his Bachelor's degree. Now his research field is about the oil-gas field development, and reservoir numerical simulation.

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