Modelling of Gas Recovery from Unconventional Reservoir Shale Gas.

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ABSTRACT

It is believed that petroleum gas is stored as free gas in natural fractures, free gas in pores, adsorbed gas and dissolved gas in kerogen bulk in the shale. Hydraulic Fracking is used to promote free gas flow to production well, but adsorbed and dissolved gas is not recovered and usually ignored. This work looks into modifying existing gas flow model, by including mechanisms that can promote and contribute to shale gas production recovery during reservoir depletion. The developed model includes non-Darcy flow which is suitable for high-velocity gas flow. Model equation was simulated with the help of MATLAB to solve the partial derivative equation to achieve a shale gas production a 3D profile of pressure vs time vs distance. The model results were seen behaving similarly to available developed models, whereby pressure is initially increasing and then decrease overtime. The initial increase in pressure is due to the free gas available in natural fractures and micro-fracture in the matrix and is produced first causing pressure to increase. During production, overtime free gas in these natural fractures and micro-fracture gets depleted, causing pressure to decrease and approach critical desorption pressure over time. The free gas in the matrix nanopores feed these depleted fracture networks, the kerogen nanopores is in turn fed by adsorbed and dissolved gas on kerogen inside the nanopores surface which take place at later stage of production. The developed model shows similar gas recovery production behaviour with the laboratory results, which proves that the proposed model can be used to predict the production profile.