conferenceseries.com

J Pet Environ Biotechnol 2018, Volume 9
DOI:10.4172/2157-7463-C1-041

The impact of complex fracture patterns on CO_2-enhanced gas recovery and sequestration in Barnett shale reservoir

S Sina Hosseini Boosari[1] and Mohammad O Eshkalak[2]
[1]West Virginia University, USA
[2]University of Texas at Austin, USA

Natural gas production from shale resources has become an increasingly growing practice that secures energy supply in the US for decades. Injecting CO_2 to Enhance the Gas Recovery (CO_2-EGR) is a potentially feasible method due to the unconventional characteristics of such formations. Therefore, it is very essential to examine the impact of complex fracture patterns on CO_2-EGR to reveal the long-term effectiveness and to better understand the performance of this treatment. Also, high uncertainty associated with the fracturing treatment design is analyzed though maximizing NPV. Real field data is obtained through personal communication with an active operating company in shale reservoir. In this work, quasi-static and static simulations were performed to characterize hydraulic fractures and their effect on CO_2-EGR treatment. As a result of stress shadowing effects, the quasi-static simulation showed different fracture patterns such as partially propagated and slanted compared to the regular straight patterns. Based on these findings, we investigated the effect of these fracture patterns on gas production using static simulations. A numerical shale gas model is developed based on Barnett rock and fluid properties. Two scenarios are investigated including continuous flooding and huff-n-puff CO_2 gas injections. Moreover, a sensitivity analysis on the most uncertain parameters such as CO_2-CH_4 adsorption isotherms, hydraulic fracture spacing and half-length, conductivity and height is performed. At the end, the operating parameters include CO_2 injection rate and time for different injector/producer well configurations are also analyzed to identify the best scenario with highest performance of CO_2-EGR. The results indicated that considering the commonly used orthogonal fracture configuration overestimates the ultimate gas recovery by 30% after 20 years and also showed almost 15% higher storage capacity of shale using partially propagated and slanted patterns. Moreover, the uncertainty analysis highlighted that the hydraulic fractures properties are the most influential parameters affecting CO_2-EGR. The findings of this work provide valuable insights into the modeling and simulation of CO_2-EGR treatment of shale wells and also into decision making process for enhancing production from shale gas assets.