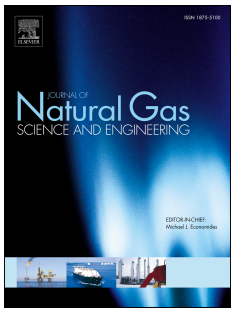
Accepted Manuscript



Relationship between tight sandstone reservoir formation and hydrocarbon charging: A case study of a Jurassic reservoir in the eastern Kuqa Depression, Tarim Basin, NW China

Song Guo, Xiuxiang Lyu, Yan Zhang

PII: S1875-5100(18)30045-3

DOI: 10.1016/j.jngse.2018.01.031

Reference: JNGSE 2438

To appear in: *Journal of Natural Gas Science and Engineering*

Received Date: 8 July 2017

Revised Date: 17 January 2018

Accepted Date: 22 January 2018

Please cite this article as: Guo, S., Lyu, X., Zhang, Y., Relationship between tight sandstone reservoir formation and hydrocarbon charging: A case study of a Jurassic reservoir in the eastern Kuqa Depression, Tarim Basin, NW China, *Journal of Natural Gas Science & Engineering* (2018), doi: 10.1016/j.jngse.2018.01.031.

Relationship between Tight Sandstone Reservoir Formation and Hydrocarbon Charging: A case study of a Jurassic reservoir in the Eastern Kuqa Depression, Tarim Basin, NW China

Song Guo[1, 2] Xiuxiang Lyu[1, 2*] Yan Zhang[1, 2]

(*1. College of Geoscience, China University of Petroleum, Beijing 102249, China;*
2. State Key Laboratory of Petroleum Resource and Prospecting, China University of Petroleum, Beijing 102249, China)

Abstract: The Kuqa Depression in the Tarim Basin is a prolific tight sandstone gas-producing area in China. In the eastern part of the depression, the assessed tight sandstone gas resource is approximately 1×10^{12} m^3. To more accurately analyse the accumulation process of tight sandstone gas reservoirs, based on a comprehensive investigation of the characteristics and porosity evolution of the sandstone reservoir and hydrocarbon charging history, the relationship between hydrocarbon charging and tight sandstone reservoir formation is analysed. Collective evidence indicates that the Lower Jurassic Ahe Formation tight sandstone reservoir in the eastern Kuqa Depression is strongly heterogeneous, and the reservoir space is predominantly intergranular and intragranular dissolution pores. The development of fractures could improve reservoir properties, whereas compaction mainly led to the formation of the tight reservoir. The evolution in reservoir porosity shows that the Ahe Formation was compacted (porosity was less than 10%) at circa 12 Ma. Fluid inclusion analysis shows that there were two charge peaks with characteristics of “early oil and late gas”. The first oil charge peak occurred during 23–12 Ma, and the second gas charge peak occurred during 5–2 Ma. The Ahe Formation tight sandstone reservoirs in the eastern Kuqa Depression had higher porosities during the period of oil charge than those during natural gas charge because the sandstone reservoirs had experienced strong compaction and caused the formation of tight sandstone reservoirs, which means that the period of reservoir densification was earlier than the period of large-scale natural gas charging. Abnormal pore fluid pressure is the major driving force of gas migration rather than buoyancy in the tight reservoir. The mechanism whereby the natural gas completely displaced the pore water in the tight reservoir created the current distribution of "upper gas and lower water". Since the Quaternary, intense tectonic movement has destroyed the tight gas reservoirs in the structural high and adjusted the tight gas reservoirs in the structural low, forming the present distribution of oil and gas.

KEY WORDS: Tarim Basin; eastern Kuqa Depression; tight sandstone reservoir; petroleum charge; porosity evolution