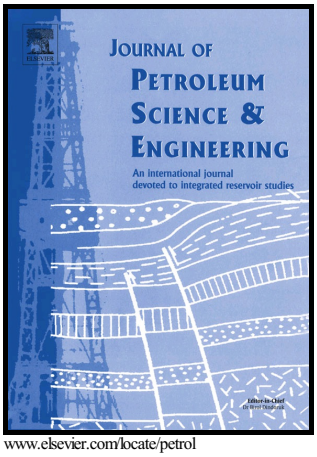

www.elsevier.com/locate/petrol

Enhanced Oil Recovery by Air-Foam Flooding System in Tight Oil Reservoirs: Study on the Profile-Controlling Mechanisms

Pengcheng Liu, Xiaokun Zhang, Yongbin Wu, Xiuluan Li

PII: S0920-4105(16)31181-0
DOI: http://dx.doi.org/10.1016/j.petrol.2016.12.001
Reference: PETROL3769

To appear in: *Journal of Petroleum Science and Engineering*

Received date: 17 October 2015
Revised date: 9 November 2016
Accepted date: 1 December 2016

Cite this article as: Pengcheng Liu, Xiaokun Zhang, Yongbin Wu and Xiuluan Li Enhanced Oil Recovery by Air-Foam Flooding System in Tight Oil Reservoirs Study on the Profile-Controlling Mechanisms, *Journal of Petroleum Science and Engineering,* http://dx.doi.org/10.1016/j.petrol.2016.12.001

Enhanced Oil Recovery by Air-Foam Flooding System in Tight Oil Reservoirs: Study on the Profile-Controlling Mechanisms

Pengcheng Liu [a,*], Xiaokun Zhang [a], Yongbin Wu [b], Xiuluan Li[b]

[a]School of Energy Resources, China University of Geosciences, Beijing, 100083, China

[b]State Key Laboratory of Enhanced Oil Recovery, China National Petroleum Company, Beijing, 100083, China

[*]Corresponding author. Tel.: +86 13522168398. liupengcheng8883@sohu.com

ABSTRACT

A one-dimensional long core displacement experiment was designed based on injection of pure foam liquid, air, and air-foam system into the tight matrix core and fracture core. This aimed to verify the individual injection capacity of these materials in the ZenPing well area in a typical tight oilfield, China. The results indicate that the air-foam system cannot be injected directly into the tight matrix core. However, because some of the foaming agent is absorbed by the reservoir rock, causing foam collapse, the defoamed liquid and separated air can flow into the tight matrix core, which results in stable displacement. Three-core parallel displacement experiments were designed, including two matrix cores (with permeability difference ratios of 10) and one fractured core. The results indicated that the air-foam system mostly flows into the fractured core and blocks the fractures. Thereby, some of the defoamed liquid and separated air could flow into the matrix core to displace the residual oil. The residual oil saturation and the oil displacement efficiency were 21.12% lower and 32.89% higher, respectively, than those of water flooding. We also analyzed the profile-controlling mechanisms, which indicated the air-foam system flooding is capable of improving performance following water flooding. We recommend that water flooding should be switched to air-foam system flooding as early as possible before the water cut reaches around 90%. Our findings were successfully used to guide a pilot test of the ZenPing well area. The results indicate that air-foam flooding is a feasible means for improving oil recovery in tight oil reservoirs.

***Keywords*:** Enhanced oil recovery (EOR) by foam; Tight oil reservoirs; Oil displacement efficiency; Oil well fracture; Water flooding; EOR pilot test

1. Introduction

Tight oil reservoirs are defined worldwide as those with a matrix permeability of less than 1.0 mD. Tight oil reservoirs have recently become significant hydrocarbon sources and have become a hotspot for exploration and development of global unconventional oil and gas resources following shale gas reservoirs