## Accepted Manuscript

An innovative approach to relative permeability estimation of naturally fractured carbonate rocks

Abdulrahman S. Aljehani, Ying Da Wang, Sheikh S. Rahman

PII: S0920-4105(17)31012-4

DOI: 10.1016/j.petrol.2017.12.055

Reference: PETROL 4545

To appear in: Journal of Petroleum Science and Engineering

Received Date: 11 June 2017

Revised Date: 31 October 2017

Accepted Date: 17 December 2017

Please cite this article as: Aljehani, A.S., Wang, Y.D., Rahman, S.S., An innovative approach to relative permeability estimation of naturally fractured carbonate rocks, *Journal of Petroleum Science and Engineering* (2018), doi: 10.1016/j.petrol.2017.12.055.

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.



### 1 An Innovative Approach to Relative Permeability Estimation 2 of Naturally Fractured Carbonate Peeks

2

3 4

5

of Naturally Fractured Carbonate Rocks

Abdulrahman S. ALJEHANI<sup>1</sup>, Ying Da. WANG and Sheikh S. RAHMAN School of Petroleum Engineering, The University of New South Wales (UNSW)

#### 6 Abstract

7 This paper presents an innovative numerical procedure for flow simulation and 8 estimation of relative permeability of naturally fractured carbonate rocks by history matching 9 laboratory derived multi-phase production data. The multi-phase flow simulator accounts for 10 flow in discrete fractures with variable asperities. These discrete fractures are characterised by the fracture surface topography which is imaged with the use of surface laser scanning and 11 12 micro computed tomography ( $\mu$ -CT). Next, the production data for naturally fractured 13 carbonate samples (matrix and fracture permeability), samples with no fracture (matrix permeability only) and samples with fracture only (near zero matrix permeability) for 14 15 unsteady state conditions are obtained. Forward simulation performed by coupling both the matrix and fracture relative permeability to estimate production for a porous fractured 16 17 system. This is validated by comparing to the laboratory obtained production data. This has allowed us to validate the proposed numerical procedure and subsequently history match the 18 19 experimental production data for the porous fractured system to obtain overall porous 20 fractured relative permeability curves. Results of this study show that there exists a strong 21 discontinuity of phase saturation. It was also observed that Corey's parameters are best suited 22 for history matching of the production data through porous matrix, and cubic parameters are 23 best suited for fracture.

*Keywords:* Fracture roughness, Discrete fracture flow, Multiphase flow, Relative
permeability, Capillary pressure

#### 26 **1. Introduction**

27 The presence of fractures plays a significant role in the transport of fluids in petroleum 28 and geothermal reservoirs as well as waste management due to the considerable amount of 29 hydrocarbons and the possibility of leakage respectively. Central to flow simulation, relative 30 permeability is an important parameter for estimating saturation profile of different phases 31 and holds key to evaluating the production potential of a reservoir and its ultimate recovery. 32 Relative permeability is yet considered one of the most uncertain parameters in multiphase 33 fluid flow simulation, in particular in fractured reservoirs (Kazemi, 1969, Kazemi et al., 34 1976, Kazemi et al., 1992, Diomampo, 2001, Shad and Gates, 2010). Typically, most 35 naturally fractured reservoirs have petrophysical properties varying between matrix and

<sup>&</sup>lt;sup>1</sup> Corresponding author. Email: <u>aljehani.abdulrahman@gmail.com</u> (A. S. ALJEHANI)

Download English Version:

# https://daneshyari.com/en/article/8125414

Download Persian Version:

https://daneshyari.com/article/8125414

Daneshyari.com