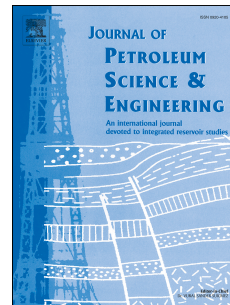


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Application of water injection curves for the dynamic analysis of fractured-vuggy carbonate reservoirs

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# Application of Water Injection Curves for the Dynamic Analysis of Fractured-vuggy Carbonate Reservoirs

**Abstract:** In Tahe Oilfield, Tarim Basin, NW China, the carbonate reservoir displays poor porosity and permeability in its matrix, while the fractured-vuggy system is distributed in a random, discrete and discontinuous way, which yields significant oil rates once the fractured-vuggy system is connected by production wells. The fractured-vuggy carbonate reservoirs are consisting of a group of large caves and inter-connected by high permeability fractures. Due to lack of powerful and suitable EOR (Improved Oil Recovery) strategies, depletion-drive recovery is commonly adopted for practical production at the beginning. After a period of production, the elastic energy of the cave formation weakens, causing insufficient liquid supply, the water injected for water flooding is used to improve the oil recovery of the fractured-vuggy carbonate reservoirs. However, the water injection curves of the carbonate reservoir are different from that of the sandstone reservoir as their fundamental flow mechanisms are different. For the fractured-vuggy reservoirs with high permeability, the water injection curves can be adopted to calculate the volumes in place of crude oil and formation water in a single or multi-caves. This paper presents a new model of injection curves. Using the proposed model with multi-round water injection curves, we can initially judge reservoir type and determine the volumes of cave, crude oil and water in the caves reasonably. Besides, as testified by the practical case, the parameters interpreted by the new models are proved to be reasonable and reliable. This new model is a useful tool to estimate the crude oil reserves, to demonstrate how much remaining oil in the caves, and to identify where the water-oil contact is.

**Keywords:** Fractured-vuggy formation; Carbonate reservoir; Water injection curves; Crude oil reserve; Dynamic analysis

## 1. Introduction

There are varieties of carbonate reservoirs in China, however, the main oil

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