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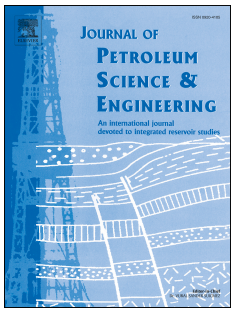

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A New Approach in Petrophysical Rock Typing

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Abstract

Petrophysical rock typing in reservoir characterization is an important input for successful drilling, production, injection, reservoir studies and simulation. In this study petrophysical rock typing is divided into two major categories: 1) a petrophysical static rock type (PSRT): a collection of rocks having the same primary drainage capillary pressure curves or unique water saturation for a given height above the free water level, 2) a petrophysical dynamic rock type (PDRT): a set of rocks with a similar fluid flow behavior. It was shown that static and dynamic rock types do not necessarily overlap or share petrophysical properties, regardless of wettability. In addition, a new index is developed to define PDRTs via the Kozeny-Carman equation and Darcy's law. We also proposed a different index for delineation of PSRTs by combining the Young–Laplace capillary pressure expression and the Kozeny-Carman equation. These new indices were compared with the existing theoretical and empirical indices. Results showed that our indices are representatives of previously developed models which were also tested with mercury injection capillary pressure, water-oil primary drainage capillary pressure, and water-oil relative permeability data on core plugs from a highly heterogeneous carbonate reservoir in an Iranian oil field. This study enabled us to modify the conventional J-function to enhance its capability of normalizing capillary pressure data universally.

Key words: petrophyisics, rock typing, hydraulic flow unit, Kozeny-Carman, reservoir characterization

1. Introduction

Petrophysical rock typing has a wide variety of applications such as: drilling (e.g., prediction of high mud-loss intervals), production (e.g., potential production zones, locating perforations, diversion system design in acidizing, and prediction of high injectivity zones) (Roque et al.,