Petrophysical Properties from Quantitative Multiscale Pore-Structure Characterization in Unconventional Carbonate Reservoir: An Example from the Mid-Continent Mississippian Limestones*

Fnu Suriamin¹ and Matthew J. Pranter²

Search and Discovery Article #80598 (2017)**
Posted June 5, 2017

*Adapted from poster presentation given at AAPG 2017 Annual Convention and Exhibition, Houston, Texas, April 2-5, 2017
See similar articles Search and Discovery Article #41906 (2016) and Search and Discovery Article #41767 (2016)
**Datapages © 2017 Serial rights given by author. For all other rights contact author directly.

¹ConocoPhillips School of Geology and Geophysics, University of Oklahoma, Norman, Oklahoma, United States (fnu.suriamin-1@ou.edu)
²ConocoPhillips School of Geology and Geophysics, University of Oklahoma, Norman, Oklahoma, United States

Abstract

The Mid-Continent Mississippian Limestone is an unconventional carbonate reservoir with moderate to ultra-low permeability (< 0.0001 to 80.2 mD). A complex depositional and diagenetic history of the Mississippian Limestone has resulted in a variety of pore types with different shapes, pore sizes, and pore-size distribution. These heterogeneous pore-system properties play a significant role in controlling fluid storage, connectivity of the pores, and fluid flow in a reservoir. Although pore characterization is essential in carbonate petrophysical analysis, little quantitative information on the pore-structure parameters and their fundamental relationships in an unconventional carbonate reservoir are currently available. This study focuses on image-analysis approaches for the multiscale pore characterization of the unconventional Mississippian Limestone reservoir based on thin sections and scanning electron microscope (SEM) images. The pore sizes are classified into macropores, mesopores, micropores, and nanopores. The relationships among porosity, pore shapes, predominant pore sizes (< 62 micrometer), pore-size distribution, and fluid saturation are investigated and related to core-based lithofacies such as brecciated chert, skeletal packstone-grainstone, peloidal mudstone-wackestone, bioturbated peloidal packstone-grainstone, nodular peloidal packstone-grainstone, bedded peloidal packstone-grainstone, and bioturbated mudstone-wackestone. These relationships are also explored for permeability prediction in the Mississippian unconventional carbonate reservoir.

References Cited


Blakey, 2013, Paleography Map of North America During Early Mississippian (Kinderhookian): Colorado Plateau Geosystems, Phoenix, AZ.


Website Cited