Depositional and Stratigraphic Architecture of Mixed Siliciclastic and Carbonate Reservoirs in the Lower Carboniferous (Mississippian) System of the Midcontinent, USA.

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Abstract

The U.S. Geological Survey completed an assessment of the Anadarko Basin and concluded that in 2010 the estimated technically recoverable undiscovered resources were 495 million barrels of oil, 27.5 trillion cubic feet of natural gas, and 410 million barrels of natural gas liquids. Since then the EIA reported (March 2015) peak oil production at 498,000 barrels/day, with an expectation to contribute to U.S. production growth through low crude oil market conditions. Production forecasts predicted the Anadarko region to grow to over 500,000 barrels/day by end of 2018, and provide higher profit margins for operators with low transportation costs from wellhead to the trade and distribution hub in Cushing, OK. In order to compound a higher profit margin potential gain of efficiencies in drilling, completions, and production must be investigated. The key to increasing these efficiencies is by understanding the reservoirs. This project addresses the fundamental depositional and stratigraphic framework of mixed siliciclastic and carbonate reservoirs in the Lower Carboniferous (Mississippian) system of the Anadarko Basin. Integration of petrographic, sedimentologic, conventional core analyses, and well logs from key points along a transect across the Anadarko Shelf in north west Oklahoma into the Anadarko Basin in south central Oklahoma demonstrates the lateral variability within the depositional system, and how that system changed temporally producing vertical heterogeneity. During the Tournaisian (Osagean) of the Lower Carboniferous an

extensive carbonate ramp developed across the midcontinent depositing complex reservoirs that are controlled by secondary diagenetic processes that altered the carbonate textures and fabrics. Later in the Visean (Meramecian) and Serpukhovian (Chesterian) of the Lower Carboniferous tectonic and glacioeustatic events transitioned the carbonate ramp into a siliciclastic dominated system, which added heterogeneity to porosity types and distributions as well as effective permeability pathways that control hydrocarbon production. Understanding these depositional heterogeneities and implementing the key geologic concepts will provide a platform for further investigating optimal completion strategies, fracture driven interference risks, and secondary EOR potential within stacked target zones of Lower Carboniferous (Mississippian) strata in order to increase the higher profit margin potential of the Anadarko Basin.