

Petrophysical Assessment of the Leonardian San Andreas Formation, Andrews County, Texas

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Abstract

The San Andres Formation is a major oil-producing unit within the Permian Basin in West Texas and New Mexico. Currently, the cumulative production from the San Andres reservoirs stands at 10 billion barrels of oil equivalent, making the San Andres reservoirs the most productive carbonate play within the Permian Basin. Within the Permian period, the San Andres Formation located on the Central Basin Platform lies in between the Lower Guadalupian (Upper Permian) and the Upper Leonardian carbonates (Lower Permian). In the San Andres, most production is from the shelf and platform carbonate reservoirs, dominated by dolomitized carbonates and anhydrites. These characteristics makes the San Andres an important hydrocarbon-producing formation. However, the heterogeneity in the reservoir properties across the carbonate interval warrants a deeper look at the facies and petrophysical properties. Here, we analyze facies changes and the petrophysical characteristics of the San Andres Formation in the Tex-Mex field in Andrews County, Texas, using core-calibrated petrophysics for the Monument 4 well. A combination of resistivity, spectral gamma ray, photoelectric factor, neutron porosity, and density well logs are used in Interactive Petrophysics (IP) software to create several petrophysical models. These include porosity and permeability analyses, mineral modeling, and “rock typing” (facies identification). These are then correlated to the core data, consisting of facies descriptions, x-ray diffraction, porosity, permeability, and mechanical strength. Facies are then interpreted based upon the petrophysical and core data to describe changes in deposition of the San Andres units throughout the upper Leonardian to Lower Guadalupian Stage in the field. This study lays the groundwork for continued research in the Tex-Mex Field on the northern-most periphery of the Central Basin Platform and future core studies.