

The Depositional Environment and Sequence Stratigraphy of the San Angelo Formation, Garza County, Texas

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The Permian (Leonardian) San Angelo Formation is an observable and mapable unit in many parts of the Eastern Shelf of the Permian Basin in West Texas (Beede & Christener, 1926). It is the stratigraphic equivalent of the Glorieta Formation of the central and western Permian Basin in west Texas and southeastern New Mexico. This study is based on cores taken in the San Angelo Formation from three wells in Garza Oil Field, Garza County, Texas. The three slabbed cores total about 324 feet total thickness.

The goals of this research are to determine the rock types, lithofacies, depositional environments and depositional cycles (parasequence) in the three cored wells.. And to An additional goal is to investigate porosity throughout the cored interval and to identify the best reservoir facies. The San Angelo Formation consists of shallowing upward cycles of siliciclastic and carbonate deposits. In Garza County, Texas, the San Angelo Formation constitutes a petroleum reservoir that consists primarily of dolomitized carbonates.

Most of the cored intervals are dolomite with intervals of sandstone, sandy dolomite and dolomitic sandstone. Diagenetic minerals include anhydrite as fracture-fill and replacement, and occasionally silica (chalcedony) as a replacement and pore-space filling mineral. Vuggy and moldic pore types are very common in many cored intervals. Interparticle porosity is more common in the grainy core intervals, especially within the marine shoal intervals. Virtually all of the carbonate grains have been dolomitized and occasionally replaced by anhydrite. Regardless of the intensive dolomitization, many grains are still identifiable, due to shape or mode of preservation.

Most carbonate cycles represent shallowing upward units comparable to

“parasequences”, which are defined as relatively conformable successions of genetically related beds or bedsets bounded by marine-flooding surfaces or their correlative deepening depositional surfaces. (Wagoner, Mitchum and etc. 2006). This study has investigated depositional cyclicity in the San Angelo Formation in all three cores and determined all cycle boundaries. The San Angelo Formation in Garza County contains a variety of cycle types. These cycles range from tidal flat to open marine cycles as well as reef and marine shoal cycles. The lithofacies in the two Brown Brothers wells are very similar and could be correlated. Both of them contain tidal flat, marine shoal, and open marine types of cycles. In contrast, the Sun Post well contains only reef/mound, and open marine facies. Both of the Browne Brothers wells contain aggradational-stacking of marine shoal and tidal flats that represent highstand systems track

The oolitic packstone/grainstone dolomite intervals, (shoal-topped cycles), are the best potential reservoirs in the San Angelo Formation. The porosity in these intervals is up to 20%.

In any further petroleum exploration and development, applying the principles of sequence stratigraphy is a key. The multiple oolitic packstone/grainstone (marine shoal) facies should be the main target and tracing this facies should not only be along paleo depositional strike within a single cycle, but also down-dip and up-dip in underlying and overlying cycles.

