

Permian Basin – Why So Prolific?

Donald P. McGookey
Geologist

Mother nature did everything right to create the major petroleum reserves of the Permian Basin. Throughout the 300 million years of the Paleozoic Era the southwest part of the North American plate moved back and forth across the Equator, staying within the 30-degree north and south latitudes. The paleogeography that resulted from these latitudinal positions contributed to the deposition of thick source beds and excellent reservoirs for the storage of oil and gas in the Permian Basin.

During the Paleozoic there were three major changes in this area. A broad spoon-shaped basin along the southwest edge of the continent characterized the Permian Basin area from Cambrian to Middle Mississippian.

From Middle Mississippian to early Permian time, the entire southwest part of the continent was subjected to periodic twisting plate tectonic movements that formed contemporaneous compressional basins and uplifts from the Oquirrh Basin of northwest Utah to the Ouachita Trend. The latter is a collision boundary that extends from southwest Texas to Mississippi.

Major features of this time in the Permian Basin of West Texas and southeast New Mexico were the Diablo Uplift, Delaware Basin, Central Basin Platform, Midland Basin and the Eastern Shelf (west flank of Llano Uplift). The basins were the receptacles of thick deep-water shales and turbidites. The flanks of the uplifts were the site of pinnacle and barrier reefs, shelf carbonates and fluvial systems. All Late Paleozoic sedimentation was cyclic and controlled by changes in sea level caused by periodic continental glaciation in the southern hemisphere.

During the remainder of the Permian, the basins were filled to the brim and the uplifted areas were buried. The last event in the Permian was the deposition of a thick evaporite section over the entire area. The evaporites provided an excellent seal to prevent escape of migrating hydrocarbons. The basins and uplifts have remained buried and undisturbed since the end of the Permian.

Major accumulations of oil and gas always enjoy the simple parameters of:

- Source(s)
- Burial of source beds to proper depth
- Migration of oil and gas to
- Thick Reservoir sections
- Structural and stratigraphic traps
- Seals
- Relatively simple history since migration.

These parameters can be visualized as a giant chemical system. The Permian Basin had the optimum history that developed, and closed, the system.