Stratigraphic and Structural Controls on Hydrocarbon Production in Paleogene and Cretaceous Plays of Onshore Texas

Nelson Waltrip[1], John Snedden[2]
[1]University of Texas at Austin; [2]UT -Austin

9.29.2020 - 10.1.2020 – AAPG Annual Convention and Exhibition 2020, Online/Virtual

Abstract

The Olmos Sandstone of the Upper Cretaceous Taylor Group and Lobo sandstone of the Late Paleocene Lower Wilcox are two significant tight sandstone gas-producing plays in south Texas. Deposition of the Olmos occurred in the easternmost portion of the Rio Grande Embayment in shelf, shoreface, and deltaic system paleoenvironments. With a southeasterly dip, the Olmos can be separated spatially, structurally, and by depositional patterns into an updip trend and a downdip trend. The updip trend can be characterized as thicker lobate deltaic deposits while the downdip trend shows a thinner, more sheet-like geometry of a shelfal environment. Similarly, the Lobo sandstone was deposited in a wave-dominated deltaic and shoreface environment. However, unlike the relatively unfaulted Olmos, the Lobo sandstone underwent significant structural deformation due to a major regional gravity slide that produced significant extensional faulting. As a result, individual fault blocks formed and have proven to be productive of gas. Eight sandstone bodies have been identified in the Lobo: Lobo 1 - 6, Walker, and stray section sandstones. The goal of this research is to utilize production data within these two plays to analyze how depositional environments, structural factors and stratigraphic elements influence producing trends. Within each play, we have developed important insights about production characteristics. Since the updip trend of the Olmos is structurally and stratigraphically different from the downdip trend, gas production profiles tend to be different, reflecting lower net to gross, grain size, and permeability in the downdip (shelfal) sandstones. As a consequence, preliminary conclusions based on type curve analysis indicate steeper

declines in the first 10 years of production in downdip trend wells due to thinner, poorer reservoir quality even though the reservoir bodies might be laterally continuous. Trapping mechanisms and drive mechanisms also appear to be different between the updip and downdip trends. On the other hand, the Lobo play production comes from individual fault blocks that differ greatly in size. Initial review of production data suggests that fault block size matters less than expected, suggesting communication between fault blocks and less effects on individual well performance based on fault block. Another significant factor of gas production in the Lobo could be the number of sand bodies present at different locations. The Lobo 1 and 6 sands are the most aerially extent, however, the Lobo 2 to 5, and Walker sands are less laterally extensive, resulting in regionally varying reservoir gross rock volume. By using production data along with a geological depositional model for the Olmos and Lobo plays, this research will advance knowledge in understanding what geological factors might affect production in these plays.