A UNIQUE AUSTIN CHALK RESERVOIR VAN FIELD, VAN ZANDT COUNTY, TEXAS

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ABSTRACT

Significant shallow oil production from the Austin Chalk was established at Van Field, Van Zandt County, in East Texas in the late 1980's. Development of the reservoir is still in progress. The Van Field structure is a complexly faulted anticline created by salt uplift. The Woodbine sands, which underlie the Austin Chalk, have been and continue to be the predominant reservoir rocks in the field. Oil migrated upward from the Woodbine along fault planes and invaded the Austin Chalk in the more permeable facies. The most prolific Austin Chalk production is upthrown on the main field fault as is the Woodbine.

The composition of the Austin Chalk in the Van Field is fairly typical of chalks elsewhere. It is a soft, white to light gray (except where oil stained) limestone composed mostly of coccoliths with some pelecypods and foraminifera. Unlike the Austin Chalk in the Giddings and Pearsall Fields in South Central Texas, the chalk at Van was not deeply buried and therefore was not as highly altered by fracturing or diagenetic processes such as compaction and cementation. As a result, the chalk retained much of its original microporosity.

The depositional environment and associated lithofacies are also keys to the reservoir quality in the Van Field. The photographs of the cores shown in Figure 1 illustrate the reservoir qualities of the upthrown (productive) and downthrown (less productive) sides of the main field fault.

The J.A. Bracken 35 #12 core is representative of the upthrown Austin Chalk lithofacies. The core grades from a light to medium gray, clay-rich, non oil stained chalk with minor burrowing at 2,351′ into a light brown, moderately to heavily burrowed, oil stained chalk at 2,350′ into a medium brown, heavily burrowed, oil stained chalk at 2,315′. This sequence is typical of the gradational transition of facies with increasing oil saturation where the best reservoir rock at 2,315′ is so intensely bioturbated that burrow outlines are indistinguishable.

The Murphree 31 #9 core is representative of the downthrown (less productive) Austin Chalk lithofacies. This chalk is light gray and more clay-rich than that on the upthrown side and is generally less intensely bioturbated. Although the burrows contain significantly less clay than the matrix, the burrow filling in the 31 #9 is more clay-rich than that of the Bracken 35 #12; compare burrows at 2740.5′ (Murphree 31 #9) and at 2350.8′ (Bracken 35 #12). The downthrown chalk facies is notably less oil saturated than the upthrown side as indicated by the lighter gray color.

At the time of Austin Chalk deposition, the main field fault was active and the upthrown side was a structural high providing a more agreeable environment for benthonic organisms such as pelecypods and worms. The bioturbation, which resulted from the increased organism population, enhanced the reservoir permeability by removing the interstitial clay. Relative permeability differences between the upthrown and downthrown chalks have greatly influenced the migration, emplacement, and production of oil at Van Field. The upthrown chalk, being more intensely bioturbated, has a higher relative permeability and is therefore more oil saturated and productive.

Future exploration for analogous Austin Chalk reservoirs should focus on areas having a shallow burial depth, a favorable environment of deposition, an underlying oil source, and faulting to provide the conduit for migration.

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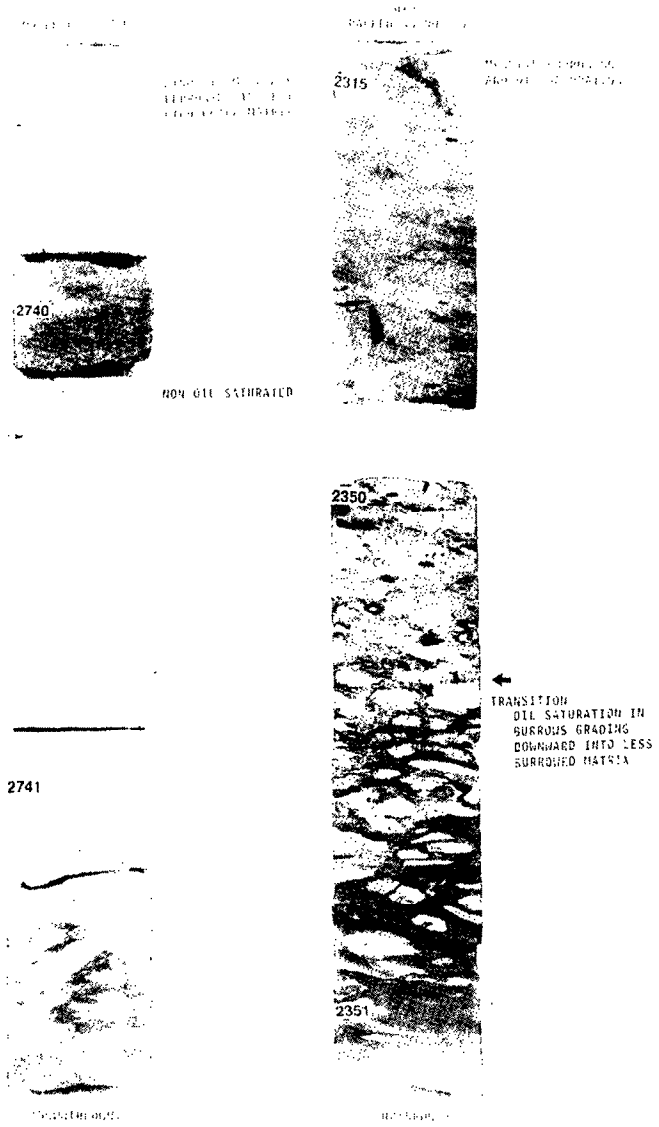

Figure 1. FACIES/OIL SATURATION RELATIONSHIPS IN THE AUSTIN CHALK, VAN FIELD, EAST TEXAS. The core shown on the left is from the downthrown side of the main field fault and is less bioturbated than the core shown on the right which is from the upthrown side of the fault. The core on the right appears darker due to oil satuaration. The relationship of increased oil saturation to the increase in bioturbation is consistent throughout the field.