Upper Jurassic Smackover Formation Facies Characterization at Little Cedar Creek Field, Conecuh County, Alabama

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The Upper Jurassic (Oxfordian) Smackover Formation is a shallow-marine carbonate unit in the subsurface of the U.S. Gulf Coast from west Florida to south Texas. A major marine transgression-regression sequence resulted in the formation's deposition. In Alabama, the top of the Smackover lies at depths from 5,000 to more than 20,000 feet. This field case-study focuses on Little Cedar Creek Field located in southeastern Conecuh County, Alabama. The objective of this study is to construct a 3-D depositional model, using GeoPlus PETRA software, for the Smackover Formation at Little Cedar Creek Field through the integration of core descriptions, thin-section analysis, well log correlation, and petrophysical data.
Little Cedar Creek Field is near the up-dip limit of the Smackover Formation in Conecuh County, Alabama. Hunt Oil Company drilled the discovery well, Cedar Creek Land & Timber Co. 30-1 #1, which tested at 30 BOPD in 1994. As of July 2009, the field has produced 9.0 MMBLS of oil and 7.7 Bcf of natural gas from over 60 wells.

At Little Cedar Creek Field, the top of the Smackover is found at depths between 10,000 to 12,000 feet, and the formation ranges in thickness from 60 to 120 feet. The Smackover Formation overlies the alluvial fan conglomerate facies of the Norphlet Formation and underlies the argillaceous, anhydritic-carbonaceous facies of the Haynesville Formation.

The petroleum reservoirs in Little Cedar Creek Field, unlike most Smackover fields in the eastern Gulf region, are composed predominantly of limestone, not dolomite, and do not possess a Buckner Anhydrite top seal immediately above the reservoir. The Smackover facies, beginning from the base, are 1) transgressive laminated mudstone, 2) bioturbated mudstone-wackestone, 3) thrombolite boundstone, 4) subtidal microstylolitic wackestone, 5) peloidal-oolitic shoal grainstone-packstone, 6) peritidal wackestone-mudstone. Production is from both the thrombolite boundstone and shoal grainstone facies, though pressure and fluid data indicate no communication between the two reservoirs.

The data indicate that the microbial communities developed in a shallow-water, low-energy, hypersaline environment, parellel to the southwest-northeast trending paleoshoreline. The Conecuh Embayment, formed by the Conecuh and Pensacola Ridges to the northwest and southeast, respectively, provided low-energy conditions that promoted the development of these opportunistic microbial organisms.