Thermal Maturation of the Tuscaloosa Marine Shale: Associations for Pore Pressure, Oil Generation, and Secondary Porosity

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ABSTRACT

The Upper Cretaceous Tuscaloosa Group (Cenomanian and Turonian) of central Louisiana and southern Mississippi is an organic rich sedimentary rock comprising a complete second-order depositional sequence. The lower Tuscaloosa Stringer sands, indicative of the low stand track, are separated from the middle Tuscaloosa Marine Shale (TMS) a transgressive system tract, by an unconformity. The Upper Tuscaloosa represents the high stand tract. The Middle unit, the TMS, has the greatest potential as a source rock or shale reservoir. With thicknesses over a 1000 ft (313 m) the Tuscaloosa Group is found from 7000 ft (2.15 km) subsea true vertical depth (SSTVD) in Mississippi to 15,000 ft (4.6 km) SSTVD in southern Louisiana. The increasing popularity of unconventional hydrocarbon plays has made the TMS an attractive area for oil exploration. Characterized by high resistivity (in excess of 5 ohm-m), the TMS has significant potential as a prolific hydrocarbon resource play.

Well logs were correlated across the area to produce structural maps of the Upper, Middle, and Lower Tuscaloosa as well as the high resistivity zone of interest. Using publically available data, a model of lithology and heat flow was used to predict temperature gradient, thermal maturation, and pore pressure for the Tuscaloosa Marine Shale. Previous work indicates that the resistive section has vitrinite reflectance (Ro) values from 0.76 to 0.78 %Ro. When folded into Zetaware's Genesis program, results on pore pressure, oil generation and porosity are calculated. This workflow will highlight the extent of the TMS that is oil prone with favorable reservoir properties.

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