Hydrocarbon Column Height Analysis from the Gulf of Mexico Basin: An Integration of Quantitative Seal Analyses and Basin Evolution

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Basins subjected to periods of rapid sedimentation are characterized by a wide range of temperature and pressure histories. Resultant seal rock reflects this range of geo-histories in their compaction state, producing a variety of pore throat radii, which is in turn responsible for the amount of hydrocarbon column height a seal unit may contain. Quantitative analysis of seal rock has been combined with detailed geo-history data to more accurately define these controls on hydrocarbon column height.

The Gulf of Mexico seal project targeted shale samples from regionally extensive maximum flooding surfaces known to trap significant volumes of hydrocarbon. These samples were analyzed using conventional techniques (x-ray diffraction, scanning electron microscopy and capillary pressure analysis) to determine which are representative of seal rock and their physical characteristics. These results were then combined with basin models to provide pressure and temperature histories for the seal rock.

Quantitative shale data and compaction trends were then integrated to define predictive seal capacity trends for the Gulf of Mexico. The trends were calibrated using actual column height data from hydrocarbon accumulations. Without accurate definition and integration of regional pressure-temperature regimes these present day hydrocarbon columns could not be explained. This project culminated in a predictive seal capacity and column height tool, whereby a geo-history, clay content and burial depth was used to define a likely range of hydrocarbon columns for a particular opportunity.