

**AAPG Annual Meeting
March 10-13, 2002
Houston, Texas**

Tom Berkman¹, Leroy Ellis², David Grass¹ (1) BP, Houston, TX (2) Terra Nova Technologies, Dallas, TX

Integration of Mud Gas Isotope Data with Field Appraisal at Horn Mountain Field, Deepwater Gulf of Mexico

Advances in sampling and analytical techniques now permit the isotopic analysis of very small amounts of hydrocarbon gases in air that are collected from the circulating mud stream during drilling. This technique has been termed Mud Gas Isotope Logging (MGIL) and employs geochemical interpretation of shows in a well. This inexpensive technique helps assess vertical and lateral reservoir compartmentalization and sealing intervals, assess charge history, and thermal maturity of hydrocarbons. Case data from the Horn Mountain Field are used to demonstrate this technology and its impact to field assessment and appraisal.

MGIL was able to deconvolve zones where multiple initial biogenic/thermogenic and pure biogenic reservoir zones were discovered. In addition, serendipitous sampling of a boundary fault uncovered pure thermogenic hydrocarbons. These data helped us better understand lateral extent and charge history of the stratigraphically separated Miocene sands.

MDT pressures and fluids were collected in 8 appraisal wells. The well data and two 3-D seismic surveys were used to assess reservoir continuity and compartmentalization. Subtle pressure and fluid differences indicated that the field may be divided into at least two compartments. MGIL data confirmed the compartments suggested by the pressure data.

MGIL data from subsequent development wells confirmed the reservoir compartments proposed earlier. The MGIL data was able to discern which compartment a well was in without the benefit of pressures. It also helped the team recognize the significance of a stratigraphic feature visible on amplitude maps which serves as a baffle. This has implications for reservoir energy and pressure support during production.