AAPG International Conference
Barcelona, Spain
September 21-24, 2003

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Integrated Petroleum Systems Modeling, Columbus Basin, Trinidad

The latest Petroleum Systems modeling has been applied by BP Trinidad and Tobago (bpTT) to the Columbus Basin, offshore east coast Trinidad. Basin modeling, pressure prediction, detailed geochemistry and structural restoration have been applied in an integrated fashion to understand petroleum distribution in the basin, and to de-risk potential new oil and gas plays. Geochemistry reveals that much of the 22TCF of gas discovered by bpTT is biogenic in origin, with significant reserves of thermogenic oil and gas remaining to be discovered. Field GOR is highly variable and controlled by a complex interplay of source maturity, trap timing, selective capture of charge, and mixing of biogenic and thermogenic products. Structural restoration and basin modeling are needed to predict petroleum composition and phase in new prospects. Understanding the pressure distribution in the basin is critical for unraveling basin plumbing and prediction of gas column height. Biogenic gas is most abundant in the relatively shallow, normally pressured Pleistocene section, but also within pressure regressions in the highly overpressured Pliocene section. Pressure regressions allow biogenic gas to come out of solution, and also form excellent hydrodynamic seals allowing large columns of gas to accumulate. Application of petroleum systems technology, and most importantly, the integration of this technology with seismic techniques for reservoir, pressure and fluid prediction, is the key to unlocking the remaining prospectivity in the basin.