AAPG Annual Convention
Salt Lake City, Utah
May 11-14, 2003

Tom Byrd, Eric J. Ekstrand, Donald C. Bruce, and Kim Syrowski, BP GoM Deepwater Development, Houston, TX

Application of Outcrop, Process Models and High Resolution 3-D Seismic in the Development of the Holstein Field, Deepwater Gulf of Mexico: A Subsurface Analog for Ponded-Basin Turbidite Reservoirs

The Holstein Field development in the deepwater Gulf of Mexico has completed pre-drilling of selected wells for production. Reservoirs comprise stacked, turbidite sheet sands deposited in a ponded basin above salt. With minimal appraisal data prior to development, a greater emphasis was placed on integrating outcrop analogs and process models with spec 3-D seismic data to plan development. Proprietary high resolution 3-D data and new drilling results have validated models and permitted the refinement of facies and permeability models to evaluate options for future reservoir management. Holstein in turn provides a 3-D subsurface analog for exploration and development.

Topographic and structural controls on sedimentation are evident in a variety of bounding surfaces and margins on 3-D seismic. These are trap analogs for exploration and also keys to facies and permeability prediction for further development. In a series of punctuated depositional episodes, common vertical sequences and facies associations demonstrate evolving intrabasinal, topographic controls from highly-confined to less-confined, base to top:

1) Repeated thin sands with bed caps from captured low density flows form segregated layers.

2) Upward-thickening beds with improved sorting and permeability result from confined high-density flows absent of the unconfined, low-density, upper-storey component. These facies demonstrate high continuity.

3) And finally amalgamation, erosional modification and sediment bypass arise from minimal confinement with significant spatial variability in reservoir quality depending on the nature of abandonment.

At reservoir scale, depositional topography dominates facies variability but structural and extrabasinal controls introduce rate dependencies and contribute to the spatial variability.

With high well costs in deepwater, the challenges remain focused on well count, placement, timing, and injection sweep efficiency. The models contribute their greatest value to the development phase and beyond into the operations phase to generate reservoir management options.