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# Seismic Pressure Prediction Method Addresses Problem Common in Deepwater Gulf of Mexico

The analysis and interpretation of calibrated seismic velocity measurements plays a critical role in the interpretation of the subsurface:

1. Accurate pore pressure prediction is needed to optimize drilling plans, avoid unscheduled events, and minimize drilling costs. The pore pressure gradient, predicted using calibrated seismic velocities, and the fracture gradient are essential to well planning.
2. Seal failure analysis, which relies on the accurate estimation of the pore pressure gradient, can be used to assess risk and prioritize exploration opportunities.
3. Seismic processing methods designed to image targets in time or depth depend critically on the accurate determination of the velocity model from the seismic data.

A method for predicting pore pressures from seismic velocities before drilling will be presented. The method overcomes a problem common in the deepwater Gulf of Mexico (GOM) where the deltaic model of a significantly thick, hydrostatically-pressured section, followed by a rapid change into geopressure, often does not hold.

Generally, geopressures start shallow below the mudline in the deepwater GOM subsurface. Conventional techniques for pressure prediction fail because these techniques require the normal interval travel time of a shale compaction trend, and such a "normal interval" is seldom drilled in the shallow section.

The new method for pressure prediction relates velocity measurements directly to effective stress, temperature, and gross lithology. This allows one, for the first time, to compute directly, simply, and repeatably the normal shale compaction interval travel time trend.

This presentation will discuss the preparation of the input seismic velocity data to improve pore pressure prediction before drilling in wildcat areas, followed by a general overview of how pore-pressures can be more reliably estimated from seismic velocities. Two published computational methods used to estimate pore pressures from seismic velocities will be compared using examples from the shelf and from the deepwater GOM.

### Bibliography

Wilhelm, R., Franceware, L. B. and Guzman, C.E. (1998) Seismic pressure-prediction method solves problem common in deepwater Gulf of Mexico, *Oil & Gas Journal*, Sept. 14.

Guzman, C.E., Davenport, H. A., and Wilhelm, R. (1997) Calibration method helps in seismic velocity interpretation, *Oil & Gas Journal*, Nov. 3, pp. 44–54. http://www.oilvel.com

### Biographical Sketch

**Rudy Wilhelm** holds a master's degree in physics from the University of Texas and a master's degree in petroleum engineering from Tulane University. After graduation, he joined Shell Oil Company as a geophysicist. His assignments were in seismic data acquisition, processing, and interpretation. He was involved in the planning and drilling of wildcat and development wells on the shelf and the deepwater Gulf of Mexico, including Bullwinkle, Popeye, Brutus, Mensa, Mars, and Ursa. He retired from Shell in 1991 and now works as a consulting geophysicist associated with Oilvel, Inc. □

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