by Jack Ward

Breaking the Rules for Seismic Reservoir Analysis

Criteria for the selection of reservoirs suitable for monitoring have been developed based on either theoretical principles or discussions around the water cooler.

In general, it is concluded that the optimum case for advanced characterization and monitoring is for low-dip, low-velocity strata that have a low-modulus fluid moving during the production process coupled with a high signal-to-noise ratio on the seismic data. Given these assumptions there is a strong tendency for the selection of reservoirs suitable for monitoring and advanced seismic characterization to be clastics associated with high GOR oils, or with gas movement on marine seismic data.

A more aggressive strategy using multi-component acquisition, alone or in combination with permanent installations, offers the opportunity to break these rules and develop methods for reservoir description extending across a wide range of traps in more challenging signal-to-noise provinces. To accomplish this goal, advancements are required in several areas:

- application of permanent installations to improve coupling, signal-to-noise ratio and repeatability,
- extension of acquisition to multi-component surveys to add new information for interpretation, and
- adaptation of conventional processing algorithms for multi-component data and fixed geometry surveys.

Results from field experiments demonstrate that there are significant developments suggesting that future surveys will capitalize on improved coupling, multi-component analysis, and new algorithms. Combining multi-component recording with new acquisition and processing concepts provides the opportunity to improve both the characterization and monitoring of reservoirs that are outside conventional wisdom for seismic work. New results extend the concept of reservoir work to include fracture mapping, detection of sand/shale ratios, and monitoring of non-gas fluid movement.

Biographical Sketch

John (Jack) Ward started his career in development geology with Texaco in 1974. In 1978 he began working with Teknica in Houston, developing quantitative techniques for seismic mapping of stratigraphic traps using seismic sonic logs. In 1991 he co-founded Simon Geolithic and engaged in AVO analysis, adding these observations to the characterization of reservoir properties. Current work at PGS includes integration of multi-component methods and permanent installations for advanced reservoir characterization and monitoring. Dr. Ward received his degree in geology from SUNY Binghamton in 1978. □

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