Using Multicomponent OBC Seismic Data for the Evaluation of Deep Gas Prospects on the Shelf in the Gulf of Mexico

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Abstract

Gas exploration in deep, unexploited basins of the Gulf of Mexico faces many challenges that have not been addressed in previous projects. The existing seismic database is largely under sampled in offset for depths below 15,000 feet, which makes the resultant image and any information that is derived from it suspect. On the shelf, infrastructures such as drilling and production platforms create surface hazards that make towed streamer acquisition of long (>15,000 feet) offsets a precarious operation. Therefore, the only viable option for exploration at this depth is to place the detectors on the seafloor using an ocean bottom cable (OBC) system. Cost considerations for this type of acquisition are much greater than for towed streamer systems, so in order for the project economics to go forward, additional risk reduction is required. This is achieved by recording both the compressional and shear energy using a multicomponent OBC system.

Over a six-month period from December 1999 until May 2000 nearly 450 square miles of multicomponent seismic data was acquired in the West Cameron area, Gulf of Mexico. This was the first multi-client application of a new ocean bottom cable and sensor package designed specifically for multicomponent applications. The split-spread style acquisition design resulted in offsets of almost 20,000 feet (6000 meters) on both sides of the shot. The primary objective of the survey was to address the imaging difficulties caused by gas invaded zones in the shallow section. Secondary objectives were related to the deep imaging challenges, both for the compressional (P-wave) data, but also the mode converted (P-S) shear data. In addition comparison of the two datasets yields information about the rock and fluid properties of the subsurface. The combination of these factors will provide the risk reduction that will make this a viable exploration tool, both in 2D and in 3D for deep gas objectives in the Gulf of Mexico.