Integrated Seismic Study of Naturally Fractured Tight Gas Reservoirs

TECHNICAL PROGRESS REPORT for the Period: 10/1/92 - 12/31/92

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This was the fifth quarter of the contract. During this quarter we (1) got approval for the NEPA requirements related to the field work, (2) placed the subcontract for the field data acquisition, (3) completed the field work, and (4) began processing the seismic data.

The Field Site

As already reported, the field data acquisition was at Amoco's Powder River Basin site in southeast Wyoming. This is a low permeability fractured site, with both gas and oil present. The reservoir is highly compartmentalized, due to the low permeability, with the fractures providing the only practical drainage paths for production. The two formations of interest are:

- The Niobrara: a fractured shale and limey shale to chalk, which is a reservoir rock, but also its own source rock.
- The Frontier: a tight sandstone lying directly below the Niobrara, brought into contact with it by an unconformity.

The fractures are thought to lie in a roughly northwest-southeast trend, along the strike of a flexure, which forms one of the boundaries of the basin.

Permitting and NEPA report

The NEPA documentation was submitted to the DOE just prior to the start of this quarter, and final NEPA approval came from the DOE in November.

Field Data Acquisition

We successfully completed acquisition of approximately 17 km of multicomponent seismic data, as outlined in the Test Plan, which was submitted last quarter.

Analysis and software

In anticipation of the new data, we worked on implementing some software that will be needed later for our interpretation and processing. One piece is a set of analysis modules for our Promax seismic processing package that will allow us to analyze the spatial distribution of arbitrary trace attributes, such as amplitude, phase, frequency content, delay time, etc. These will allow us to do very simple tomographic imaging of these attributes for things such as surface consistent amplitude analysis (critical for AVO) and detecting

spatially localized fracture anomalies such as reflectivity and attenuation. A second piece was an agreement with Dr. Victor Pereira at Weidlinger Associates that will allow us to use their advanced numerical modeling codes to simulate the models that we will be developing.

The major effort during the last half of the quarter was processing the seismic data as it began to arrive in the office. Our plan is to begin by processing the data to final stacks, using standard good processing methods and being particularly careful to preserve amplitudes. These will allow us to check global data features, insure line ties, etc. Then we will begin to focus on some of our more advanced techniques aimed specifically at fractures.

Plans for next quarter.

Our major effort this quarter will be to process the seismic data, with some software effort on implementing additional Promax modules for our specialized processing.

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