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Geophysical Technologies improve success in development of Jonah Field, Sublette County Wyoming

Jonah Field is an overpressured structural compartment in the broader (Upper Cretaceous) Lance continuous gas accumulation that lies in the Hoback Basin of SW Wyoming. It exists and is so prolific because regional shears that intersect at Jonah have limited lateral gas migration, creating a "sweet spot", high in pressure and gas saturation. The bounding shears at Jonah define the limits of overpressure and high productivity of the Lance reservoir inside the compartment vs normal pressure and lesser productivity of the reservoirs outside. Application of Geophysical technologies has significantly impacted the development of the resource at Jonah.

3D seismic data, acquired in 1996 and 1997 over Jonah, significantly improved the success for subsequent defining and drilling of the limits of the pressure compartments. In early development at Jonah the cumulative success ratio for commercial wells hovered close to 70 %. Post 3D seismic acquisition and interpretation, a better understanding of the structural complexity of the Jonah field's shear-fault geometry began emerge and the commercial success rate climbed to well above 95%.

The complex geology and physical properties of the reservoir create special challenges. To map structure, extract stratigraphy and rock properties from the seismic data requires unleashing the full arsenal of geophysical weapons available to the interpreter. The discontinuous nature of the fluvial systems contained in the Lance Pool at Jonah provide no continuous mapping horizons, and sonic logs from wells drilled with conventional water-based mud systems produce erroneous synthetic responses, further challenging the interpreter to accurately tie well results to the seismic response. Collection of VSPs, zero offset, offset and 3D, in various portions of the field have served to accurately tie the lithology in the well bore to the seismic response, improving resolution as well as provided the velocity calibration required by other techniques.

Determination of completion fracture length and orientation is a critical component to planning optimum development infill locations and spacing. Geophysical tools for understanding resultant fracture geometry and design parameters range from Borehole Microseismic mapping (to interpret completion fracture orientation and extent), to acquiring and interpreting Dipole sonic logs to determine frac physical parameters.