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Christine Krohn[1], Tom Steinhilber[1], Judy Amery-Ryland[1], Jan Mikkelsen[1], Emin Jafarov[2], Elena Effendiyeva[3] (1) ExxonMobil Exploration Company, Houston, TX (2) Exxon Azerbaijan Operating Company LLC, N/A, Azerbaijan (3) SOCAR, N/A

A Strike 3D Seismic Survey at the Zafar and Mashal Prospective Structures, South Caspian Basin, Azerbaijan: Acquisition, Processing and Interpretation

The Zafar-Mashal block is a large exploration contract area (650 sq. km.) in the deep-water sector of the south Caspian Sea, offshore Azerbaijan. Pre-survey data quality evaluation of existing 3D data sets in the area and 2D seismic lines over Zafar-Mashal raised concerns about imaging problems. Technical solutions were proposed and tested with ray-trace modeling and acquisition of a 2D seismic test program, which included lines oriented in the dip and strike directions relative to the subsurface structure.

Based on pre-survey analysis and modeling, 3D full-fold seismic data were acquired over Zafar-Mashal covering 850 sq. km. The survey was shot in the strike direction with a 25-meter cross-line bin interval using four streamers with lengths 3x5000 meter and 1x7000. The single long cable was used for velocity control at the depths of the objective for pre-stack depth migration to be completed at a later stage. Two flip-flop airgun arrays with a 4017 cubic inch volume per array were used at a 25m shot interval. Record length was 9.2 seconds with primary targets at 4.5 - 6.5 seconds.

Processing results demonstrate that with strike orientation, multiples appear more hyperbolic and have a better velocity discrimination compared to the primary reflectors. Removal of multiples by radon filtering is more effective for the strike survey, especially for attenuating the water-bottom multiples and reducing the peg-leg multiples off shallow reflectors. In areas where the primary velocity trend is slow due to presence of shallow gas, multiples remain difficult to differentiate and remove. Problems also remain where mud volcanoes and high impedance, shallow reflectors reduce or eliminate primary seismic signature. Higher signal-to-noise ratios are gained for a survey acquired in the strike direction because of improved multiple mitigation and an increased amount of data included in the 3D migration.