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USE OF ECHOMETER ACOUSTIC TOOL TO DETERMINE NITROGEN-OIL INTERFACE DEPTHS

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Abstract

The Echometer acoustic tool can provide a non-invasive, low-cost method for determining nitrogen-oil interface depths in a well that has been injected with nitrogen during a mechanical integrity test (MIT). The gas gun generates a pressure differential (pulse) which travels downhole through the gas at the speed of sound, and echoes are continuously reflected to a microphone at the surface. The reflected acoustic pulses are converted into a digitized electronic signal, which is monitored by data acquisition and analysis computer software. The nitrogen-oil interface depth generates a large acoustic reflection which is used to determine the movement of the interface depth over time. In order to test the accuracy of the tool, two oil-filled wells (brine string well, slick well) are injected with nitrogen during a MIT. The nitrogen-oil interface depths in the well change during nitrogen injection. At different time intervals, the nitrogen-oil interface depths are calculated, using both the wireline density tool and the Echometer acoustic tool. Echometer uses different initial pressure pulses to make a determination of nitrogen-oil interface depths downhole. The comparison of the nitrogen-oil interface depth measurements using the wireline tool and acoustic tool at different times determines accuracy. There are changes in the acoustic reflections due to downhole wellbore restrictions and enlargements. Also, improvements to the acoustic tool testing conditions are noted.

Key words: Echometer acoustic tool, nitrogen-oil interface depths, mechanical integrity testing (MITs), nitrogen injection, leak rates.