M05

Full-azimuth Marine Acquisition Using the Coil Shooting Technique

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SUMMARY

Wide-azimuth (WAZ) marine acquisition using towed-streamer technology has seen dramatic growth in recent years: mainly in the Gulf of Mexico. To date, the WAZ technique typically requires the use of multiple vessels. We report here on Coil Shooting*, a method of collecting full-azimuth (FAZ) data using one vessel. In this paper, we discuss survey designs for coil acquisition focusing on survey efficiency. We also show results of extended field trials and review data processing challenges such as noise removal and multiple attenuation.

Wide-azimuth (WAZ) marine acquisition using towed-streamer technology has seen dramatic growth in recent years: mainly in the Gulf of Mexico. The efficiency of these surveys has improved since the very first trials: however, the WAZ technique still requires the use of multiple vessels (typically three or four vessels). We report here on Coil Shooting*; a method of collecting full-azimuth (FAZ) data using one vessel. The survey design and feasibility testing of circular geometry acquisition has previously been reported by Moldoveanu et al. (2008) while finite-difference modelling showing comparative imaging capabilities of FAZ and other WAZ geometries has been reported by Houbiers et al. (2008). In this paper, we discuss survey designs for coil acquisition focusing on survey efficiency. We also show results of extended field trials and review data processing challenges such as noise removal and multiple attenuation.

As the term suggests, FAZ acquisition records over the full range of azimuths and offsets. In Coil Shooting this is achieved by sailing the vessel in a series of circles – or coils. Although the idea of recording while sailing in circles is not new - having been performed in the 1980s – the technology required for successful data recording and processing is relatively new. Coil shooting requires modern streamer positioning and control techniques coupled with the ability to attenuate the noise induced through shooting during the turns. We see FAZ acquisition as a natural development of the multi-azimuth (MAZ) technique used for example in the offshore Nile Delta. It is also applicable where illumination and imaging of complex sub-salt structures are required e.g. the Gulf of Suez and the Red Sea.

Coil Shooting is highly efficient in that there are no conventional breaks in recording for line turns. Instead, data are recorded continuously while the vessel sails in a circular path. The move-up between circles governs the offset and azimuth sampling of the recording. In Figure 1, we show a coil shooting design that delivers full offset and 360° azimuth sampling. Offset

Figure 1 – Coil shooting design attribute map showing azimuth coverage. Areas with azimuthal coverage > 180° can be considered to be full-fold for the purposes of imaging

and azimuth sampling are determined at the survey design stage and balanced against the required geophysical objects of the survey and budgetary constraints. Continuous shooting produces a step change in terms of productivity but also brings new challenges e.g. routine maintenance has to be performed during production time. Streamer noise is more variable, especially when cross-currents are encountered, and must be monitored and removed through onboard processing, in near

real-time.

Conclusion – Circular geometry survey acquisition design has now been commercially deployed and the effects of noise contamination due to

current crossflow on the streamers has been controlled in data processing. The result is densely sampled, full-azimuth data recorded in a highly efficient manner using only one vessel.

References:

Moldoveanu, N., Kapoor, and J., Egan, M., [2008], Full-azimuth imaging using circular geometry acquisition. The Leading Edge, Vol. 27, No. 7, 908-913

Houbiers, M., et al [2008], Full-azimuth seismic modelling in the Norwegian Sea. 78th Annual International Meeting, SEG, Expanded Abstracts, 2102 – 2106