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Desert Sparse 3D as an Alternative to 2D Exploration

B. Pagliccia* (TOTAL E&P Libye) & P.L. Pichon (TOTAL E&P Libya)

SUMMARY
In many concessions, the first step of exploration is to shoot 2D seismic to get a first rough image of the underground and then by scanning all the area, research any kind of prospects. 2D infill grids are then usually acquired on most prospective areas. The actual acquisition systems are able to record up to 10000 channels together and give the capability to record more sq.km with the same price. Sparse 3D designs aiming at specific exploration targets allows also quality/cost optimization. They can be now considered as an alternative to 2D, specially in mature basins.

Total E&P Libye operates the NC192 concession located in the Sirt basin. This exploration area is already quite mature, with a 2D grid dated 1992 for the latest, and 8 dry exploration wells drilled before Total operating.

The first re-evaluation of the block has shown that the remaining prospectivity was limited to the North, with two challenges:

- The reservoir visibility is poor (due to absence of clear impedance contrast), but can be deduced from structural understanding
- The Basement structural scheme of the North is difficult to address with the actual 2D data

The evaluation strategy of this block has to fit following conditions:

- Allowing an optimal evaluation of the remaining potential in order to define the best prospect to drill
- Keeping the most reasonable exploration cost, comparable to a classic 2D acquisition

In order to improve the assessment of the Basement structuration, and related Nubian sandstones reservoir pinchout, 3D is considered to be the only chance to obtain a breakthrough.

The challenge was to design a 3D survey, fitting the exploration imagery needs at an optimal cost, compared to a 2D acquisition.

To achieve this goal, a sparse 3D design was a must. Total Headquarters experts have worked out a feasibility study mainly based on a previous Algerian 3D experience: the decimation tests performed by our experts during the processing of this “conventional” 3D seismic has been an important input for the validation of this sparse 3D approach.
The final design takes advantage of the area's characteristics: with a desertic environment, completely flat, the vibrator production can be optimized at its maximum. Thus the design is heavy in terms of vibrated points, optimized in terms of production by the use of two vibrator fleets working in flip flop.

The contractor proposals were positive with very competitive pricing for the 3D sparse approach, validating the strategy for this seismic acquisition.

The National Oil Company gives Total full support for this approach. The acquisition took less than 2 months with a price per sq.km very similar to a standard 3D marine acquisition cost.

During the acquisition, the quality sounds promising, and the processing is underway.

This optimized exploration strategy through sparse 3D should allow the optimal assessment of the bloc potential.