Meeting Seismic Data Quality Expectations: New Dimensions in Seismic Survey Design

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During the past 10 years, the methods used to improved seismic data quality were based on increasing fold, denser subsurface coverage, and full 3D geometries. Experience has shown that (ultra) high fold surveys do not always deliver the expected improvements, decreasing the bin size has similarly failed to deliver the higher frequencies.

Designing land acquisition geometries for PDO now requires that all past experiences in an area be modeled and explained in order to set realistic expectations. The process starts with the subsurface targets and objectives. A subsurface 3D model is built and synthetic seismic data is modeled using Finite Difference in elastic and acoustic modes or with full 3D pre-stack Kirchhoff. The system is therefore quite flexible and easily implemented. Full 3D pre-stack data is created based on an inhomogeneous subsurface model for a plurality of acquisition geometries. At a minimum, all past 3D acquisition geometries are modeled as well as the proposed new acquisition geometry. The 3D volumes are processed through migration to create products for evaluation. The process recreates the characteristics of prior acquisitions and demonstrates the expected benefits of new acquisition in the area. Further, the created 3D synthetic volumes are used to test new processing strategies and algorithms.

The key value-add by deploying this technology is the ability to model the full life cycle of seismic acquisition and processing. With the 18 months experience of consistently applying this practice, we are now able to review our predictions with real 3D data results.