Miniaturized seismic sources and dispersed source arrays

Andrea Crook, Mostafa Naghizadeh

Optiseis Solutions Ltd., Calgary, Alberta

Reducing the widths of seismic cutlines helps to minimize the environmental impact of acquiring seismic surveys (Crook et. al., 2023). This can be accomplished by utilizing miniaturized seismic sources, but not all small sources provide sufficient energy for imaging deeper targets at the required resolution. Since 2020, OptiSeis has complete four case studies examining various types of miniature sources. In this case study, we present the results from the most recent 2023 field test where miniature and conventional explosive sources were deployed at 10m and 30m intervals at depths of 1m and 9m, respectively, over an approximately 3 km long seismic line with both shallow and deep targets. The charge sizes for miniature and conventional explosive sources were 0.059 and 0.5 kg, respectively. The acquired seismic data using the miniature and conventional sources was processed using a conventional processing flow with both pre-stack and post-stack migration algorithms. Also, a disperse source array configuration with 2 to 1 ratio of miniature to conventional sources at source intervals of 10m was generated from original geometries and reprocessed. The disperse array configuration was able to utilize a wider bandwidth of conventional explosive sources to fill in and remediate the low amplitude frequency components of the miniature sources. Overall, the miniature source has provided comparable resolution at all target depths examined. Results from this test will be compared/contrasted with previous test results for different target depths and with varying surface conditions illustrating the benefits of miniature sources for reduced land footprint seismic acquisition.

References

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