High Fidelity Vibratory Seismic (HFVS) - 2D acquisition and testing at Cold Lake

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Introduction

Conventional vibratory seismic data acquisition involves cross-correlating the pilot sweep sent to the vibrator with the returning reflection signals. It also commonly involves summing the returning cross-correlated signals of several sweeps and several vibrators. The High Fidelity Vibratory Seismic (HFVS) method , licensed to Enertec by Mobil, utilises the "measured motion"recorded from each vibrator, normally the "Ground Force" signal from the vibrator electronics. Recording of this signal allows many options in the collection and analysis of the data. For instance, it is possible to encode an ensemble of sweeps to allow separation of the individual vibrators, such that data may be collected much more quickly or more finely than with the conventional vibratory seismic method. Also, as the input signal is known, the reflected signals can be deconvolved with the input sweep thus yielding minimum phase records, rather than the usual zero-phase records from conventional vibratory seismic. This method makes use of the harmonics generated by the vibrator rather than treating them as noise as they would appear in the conventional cross-correlation technique.

Acquisition at Cold Lake

Enertec Resource Services equipped 4 Mertz model 26 HD vibrators, with an output force of 62,000 lbs, with transducers and electronic recorder systems to capture the measured motion signals. The vibrators were deployed along a two kilometre test line near Cold Lake, Alberta. The data was collected with a spread of 120 geophone groups spaced at 10m with a source array of 4 vibrators spaced 20m apart. This geometry allowed the data to be processed in such a way as to compare HFVS with Normal Vibroseis acquisition and processing.

Results and Conclusions

The results show that 60 fold data with CDP interval of 5 meters can be collected in the same time as a 15 fold data with a 5 meter CDP interval. However the 60 fold data looks significantly better, as one would expect, because of the increased fold and the better resolution of inter-array source statics.

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