Seismic Acquisition with 3C Digital Point Receivers: Practical Aspects

Tagir Galikeev[1], Paul Brettwood*[2]
[1]Input/Output Inc.
[2]Input/Output UK

Summary

Until recently, many of the innovations that have taken place in seismic imaging have been related to data processing, geostatistics and 4D seismic methods.

Around three years ago, a new seismic acquisition technology was introduced to the industry: acquisition is generally the most expensive part of the seismic process and the new technology promised reduced costs and superior imaging. High quality seismic data reduces the risk in reservoir characterization and improves the final geologic model of the area.

This new seismic acquisition paradigm is based on the use of VectorSeis 3C digital point-receivers, built on MEMS technology. The new sensor is dramatically different from its predecessor, the analog geophone, and some of the benefits include:

- superior recording characteristics (no amplitude or phase distortion from DC to 375 Hz @1ms);
- 3C design (each sensor simultaneously records three channels, representing the vertical and two horizontal, mutually orthogonal components);
- automatic orientation to the vertical;
- high vector fidelity;

This paper will describe the results from a survey conducted in an built-up urban area, in which the data from the vertical components of co-located VectorSeis sensors is compared for sensors deployed both conventionally (i.e. vertically) and on their side (i.e. horizontally), illustrating the tilt-insensitivity of VectorSeis and the effectiveness of the Vertical Orientation and Rotation process. Results will also be shown illustrating that the use of adaptive filtering provides ground-roll attenuation to a level comparable to that of a geophone array.

The ability of the new sensor to record low frequencies significantly benefits the seismic inversion process (no need to build highly complex initial impedance models), point receivers (no averaging of Earth response) ensure that the trace-to-trace dynamics are preserved and can be used to invert for small-scale geological features.