Recent Developments in Land Nodal Seismic Data Acquisition

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Abstract

Introduction: There has been a step change in seismic data acquisition with wide acceptance of single sensor node recording systems. However, there remain operational challenges in the areas of transition zone deployment and improving operational efficiency to reduce cost and HSE exposure. Recent successful nodal TZ projects have demonstrated solutions for working in this environment. Utilizing the inherent positioning capabilities of nodes reduces operational costs and HSE exposure by replacing traditional survey techniques. Developments in LPWAN QC networks offer additional operational benefits.

TZ & Shallow water deployment: The challenge for modern onshore nodes is that they require a GPS timing signal which cannot be received when submerged. Deployment methods for nodes have been developed and used in recent surveys to enable seamless data acquisition from land to shallow water. This avoids unnecessary omissions in onshore surveys due to inland water bodies and bridges the gap from the onshore to marine data acquisition.

Stakeless deployment: Cable free recording systems use GPS signals to maintain timing synchronisation. The GPS signal can provide position data without the need for traditional surveying. However, this ‘stakeless’ deployment technique has not been adopted because of the accuracy of the positions derived and the sensors were not necessarily at the same exact location as the GPS receiver. The adoption of single sensor nodes where the sensor and GPS antenna are co-located and the use of the latest generation of GPS chips combined with post processing of positioning data now makes this autonomous positioning by the node practical. This method greatly reduces both acquisition costs and project preparation time which is demonstrated by a recent dense receiver grid deployment in heavily wooded and hilly terrain.

Project management and HSE risk mitigation: The utilization of LPWANs for QC has been expanded to improve operational management and reduce HSE exposure. For example, there is risk of third party removal of nodes and the subsequent loss of data especially in densely populated or difficult access permit areas . Real time transmission of the location of nodes via the LPWAN enables the prompt response to interference with the spread without frequent inspection by staff as well as the potential location and eventual retrieval of lost nodes and data.
Further benefits using the established LPWAN are being developed. For example, individual wearable devices that enable monitoring of the location and status of personnel to make the management of operations more efficient, warn individuals of proximity to restricted or hazardous areas, and enable the rapid response in case of an HSE incident.

Conclusions: Recent projects have proven the practicality of using onshore nodal technology for data acquisition in the transition zone and shallow water environment. The inherent GPS capabilities of modern single sensor nodes provides position accuracy within 1m which enables stakeless deployment generating considerable cost and time savings. The use of LPWAN QC capabilities is being extended to provide additional project management and HSE benefits.