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Challenges and Solutions for Seismic Data Acquisition in Complicated TZ and Urban Areas within Kuwait

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ABSTRACT

Transition zone seismic operations are very complicated. The complications are mainly reflected in more equipment, more complex production organization and more acquisition technology applications. Kuwait Bay 3D seismic survey also included Kuwait City and its coastal suburbs. Complications in seismic operation in urban areas result from the distributions of buildings, industrial facilities and population. The traffic is always busy with high traffic flow. The conditions of underground facilities are complex containing oil and gas pipelines, water pipelines, fiber cables and so on. High voltage lines, power plants and military camps are widely distributed. This kind of survey areas were previously considered “Seismic Exploration No-go Areas as all of these elements will bring many challenges for seismic operations, such as source and receiver positioning, planning due to the crisscrossed roads, the radio communication restrictions from the high buildings, the transportation risk from the high traffic flow etc. This paper lists six main challenges the seismic crew has faced during the operation and presents the solutions adopted for these challenges and explained the key methods of successfully completing the project. The contents also covers the planning, the combined acquisition systems, the various permitting ways, the new driving risk control method, the equipment improvement process and the tailor-made software system. This study found that good scouting and planning are very important and helpful to complete successfully such a complex transition zone survey. The cable-free wireless acquisition system was really a good choice for the urban seismic operation, it reduced so many difficulties of cable deployment and combined with the autonomous shooting technology it really improved the operation efficiency. The use of Uni-Vibs and a super shallow air gun ensured the data integrity and reduced the risks. Tailor-made software solved the data merging between two different kinds of acquisition systems, onshore wireless system and dual sensor ocean bottom cables. Finally, within the big urban area, effective transportation risk control method ensured that hundreds of vehicles worked safely which is the most important concern in such seismic operations.