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Application Of Acquisition-In-Turn Technology in 3D Seismic Survey in Off-coast East Sabah, Offshore Malaysia

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Abstract

Block X covers an area of 5,857 sq.km. off the coast of east Sabah, offshore Malaysia. A new 3-D survey was acquired during September-October of 2022 (~ 950 Km2) and processed in 2023/24 with the main objective of evaluating the prospectivity of the block. The new 3D survey is located adjacent to the discovered resource opportunities (DROs) that were drilled between 1970-1994 and were followed by legacy 3D data acquired in 2003 (~ 1,400 Km2) for an appraisal drilling campaign (2005-2008). The shallow water depth between 20-40 meters, which covers a significant portion of the new 3D survey area, represents one of the biggest challenges for the seismic acquisition program.

The integration of Acquisition-In-Turn technology into seismic surveying represents a significant advancement in the continuous recording of geological data, particularly during line turns or changes and in navigating doglegs section. This technology offers a suite of benefits aimed at addressing access issues commonly encountered around reefs and shoals, as well as enhancing seismic coverage in shallow water areas. The solution provided by this technology is notable for its flexibility, which is crucial in areas with limited maneuverability, often referred to as having little to no escape room. Moreover, the solution optimizes coverage, efficiency, and data quality in shallow waters.

The technical commitment to acquire some data non-linearly using Acquisition-In-Turn technology in shallow water areas underscores the industry's dedication to overcoming traditional limitations. However, this approach does not come without its challenges. Detailed shot records are required for precise positioning—a task that demands meticulous attention and advanced technology. Additionally, underwater currents can significantly impact data quality; this challenge is addressed using steerable streamers coupled with metocean prediction tools that anticipate oceanic conditions.

Another challenge lies in ensuring water depth accuracy which necessitates comprehensive bathymetry surveys prior to data acquisition. Surface constraints also pose significant hurdles; debris and fishing traps can interfere with survey operations. To mitigate these risks, proactive fish traps and hazard scouting are conducted ahead of the survey duration. The coordination of support vessels plays a pivotal role in the successful execution of a survey campaign—highlighting the importance of strategic planning and resource management.

In conclusion, Acquisition-In-Turn technology comes highly recommended for acquisition design due to its ability to navigate complex environments effectively—particularly those characterized by shallow waters with restricted access points. Its adoption signifies a commitment not only to technological innovation but also to achieving higher standards of environmental stewardship through improved operational practices. This abstract encapsulates key information about Acquisition-In-Turn technology, its benefits, challenges, and its recommended use in acquisition design, especially in shallow waters with restricted access.

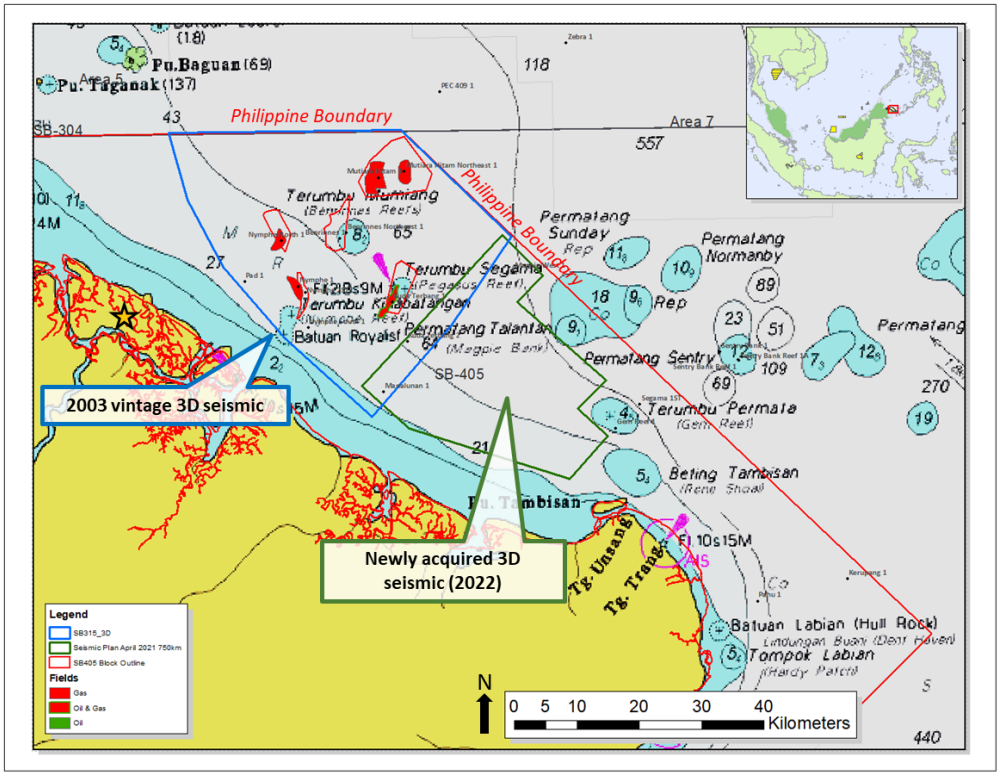

Figure 1: Location map showing the new 3D survey outline along with Philippines boundary, presence of reefs & shoals and *shallow water depth surrounding the survey area which poses operational challenges to the seismic survey campaign. (*Modified from Royal Malaysian Navy Admiralty Chart MAL6 edition 2014)*.

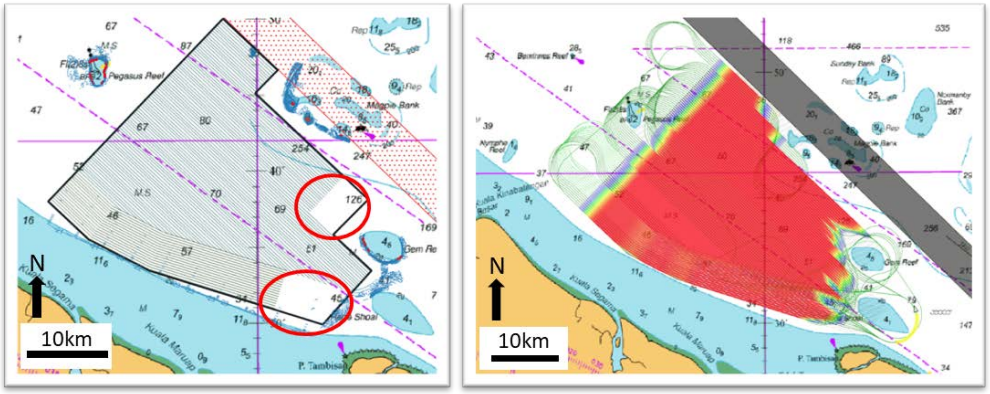

Figure 2: Final base pre-plot (left) and survey footprint (right) illustrating the hybrid concept deployed in the newly acquired 3D seismic survey including conventional and dogleg/during-turn acquisition area. This solution allows flexibility in areas with little to no escape room and optimizes coverage, efficiency and data quality in shallow water. *(Modified from Royal Malaysian Navy Admiralty Chart MAL6 edition 2014)*.

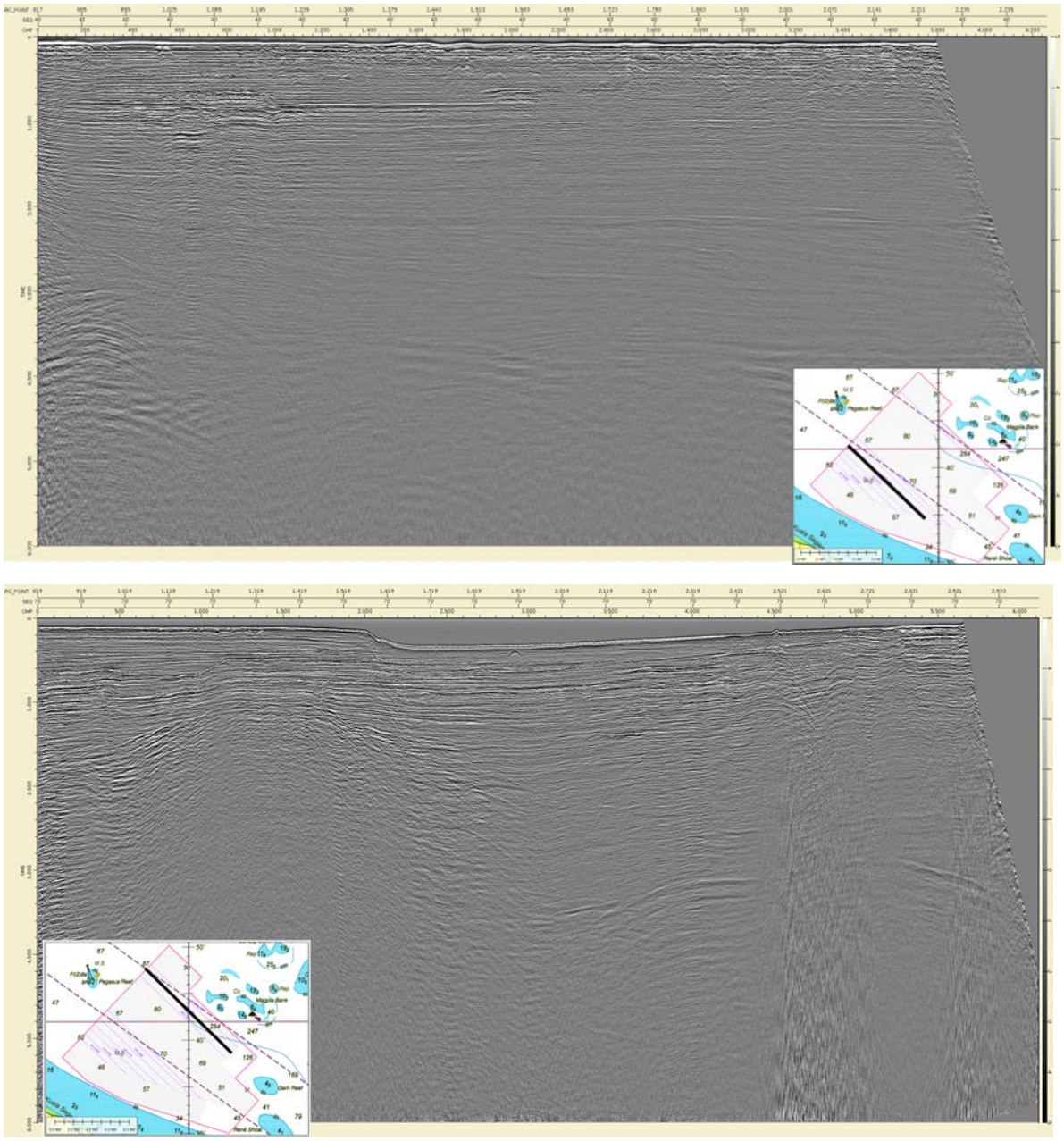

Figure 3: Brute stack sequence #40 (above) and #80 (below) denoting an overall good data quality with exception of bend noise due to turn which was addressed later in the processing workflow.