

Unlocking Potential Resources at Shallow Zone for Future Development: Methodology and Application at Sisi Nubi Fields, Mahakam Delta

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ABSTRACT

Sisi-Nubi (SNB) is a gas field located 25 km offshore from the modern Mahakam delta. It consists of 3 stratigraphic units: Shallow zone, Fresh water sands and Sisi Main zone. Current development planning focused on Fresh Water Sands (FWS) and Sisi Main Zone (SMZ) interval to tackle natural gas decline. Shallow zone is practically under-developed as the gas production is limited only from reservoirs crossed by existing wells. Shallow zone is multi-layer reservoir and unconsolidated which situated at depth 500-1800 mSS. The depositional environment is interpreted as shallow marine environment with periodic fluvial influx resulting from high frequency sea level fall.

Integrated subsurface study was conducted to define methodology in order to unlock shallow zone reservoir for future development. Seismic reprocessing was previously carried out in 2014 to improve seismic image at shallow part of the field. Taking advantage of being AVO class 3 sands, detailed iterative work between geologist and geophysicist were intensively conducted in order to; 1) understand geological framework of Shallow zone, 2) define reservoir bodies from far amplitude sub-stack. Post-mortem analysis for each drilled reservoir and its AVO responds grouped the anomalies into 3 categories of confidence level: Low, Medium, and High with success ratio respectively 15/38/61%. This was considered too low to proceed for further development study.

Seismic inversion was performed in order to obtain better reservoir characterization. Having distinctive characteristic, litho-seismic cube was generated using inverted P-Impedance (IP) & Poisson Ratio (PR) to predict gas sands probability. Further evaluation was performed using both sub-stack and litho seismic. This methodology improved significantly success ratio for each category of confidence level.

The challenge for field development at shallow zone is to identify the optimum platform location to reach maximum resources. A cone scanning method was developed to screen possible identified reservoir bodies that can be reached with a given set of drilling constraints from a single surface location. This method identifies and computes the associated reservoir bodies that can be accessed from a potential platform. This comprehensive G&G study proved the effectiveness method to evaluate shallow reservoir potential in Sisi-Nubi field. Similar studies have been launched in other fields in Mahakam to unlock the potential future development in Mahakam.