

Unravelling the Structural Complexity of a Marginal Field - The Asuokpu/Umutu Case Study

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The structural complexity of Asuokpu-Umutu field located in the Onshore Niger-delta necessitated the reprocessing of the 1990 vintage Orogho 3D Seismic data acquired by Shell Petroleum Development Company. The section of the 3D Seismic data covering Asuokpu-Umutu farm-out area was reprocessed in 2009 by Platform Petroleum Limited, the Operator of Asuokpu-Umutu marginal field to better understand the structural complexity of the farm-out area and explain the results of some previously drilled wells. The reprocessing involved pre-stack migration and very elaborate velocity analysis which resulted in substantially improved fault imaging.

The interpretation of reprocessed 3D Seismic data covering Asuokpu-Umutu farm out area has provided a detailed structural framework of the reservoirs which was unattainable with old 3D Seismic data. The detailed interpretation results explained the unexpected results of Umutu-5 well drilled by shell in 1989 as well as Umutu-7 well drilled by Platform Petroleum Limited.

The new scope applied in the detailed 3D Seismic interpretation entailed coarse scale (1 every 8 line) interpretation and then fine scale (every line) zoomed-in interpretation on the structural closures delineated by the coarse scale interpretation. With this technique, subtle faults not interpreted on the coarse scale interpretation were identified in the fine scale interpretation.

Generally, the detailed 3D Seismic interpretation of the reprocessed data revealed that the strike and dip of the major faults remained same. However, the complexity and discontinuity of faults increased with identification of several subtle faults on structures previously interpreted to be simple roll-over structures, resulting in several isolated pools of Hydrocarbon. The increased knowledge of the reservoirs and structural complexity of the field, with detailed fault seal analysis to confirm communication between the isolated Hydrocarbon pools, will lead to optimum but more expensive field development strategy for a marginal operator