

An Integrated Study to Identify New Exploratory Target in the West Kuwait Carbonate Reservoir

Mafizar Rahaman¹, Mohamed Hafez Abdul Razak¹, Tasneem Al-Rashid¹, Lulwa Al-Saleh¹, and Mohd Hameed Shereef¹

¹Kuwait Oil Company, AHMADI, Kuwait.

ABSTRACT

As a part of the exploration campaign in Western Kuwait, single sensor 3D seismic data was acquired in the Kra-Al-Maru-Kahlula area. The area is located towards the northern part of Minagish Field. Middle Minagish carbonate reservoir is well developed and a prolific producer of hydrocarbon in the Minagish field. An attempt has been made to understand the porosity distribution and to explore the hydrocarbon prospectivity of Minagish reservoir in the Kra-Al-Maru-Kahlula area. In the integrated study a comprehensive well log correlation, seismic interpretation and inversion study were carried out in the study area. In the inversion study, Geophysical and Petrophysical data were combined through deterministic seismic inversion, and an Acoustic Impedance volume was generated for the Minagish carbonate reservoir. In the inversion process, the low frequency component (0 to 10 Hz) was derived from well data and high frequency component (10 to 60 Hz) has been obtained from seismic data. A relationship between porosity and Acoustic Impedance was established using well data and applied in transforming impedance into Porosity. In the study area, few wells were drilled over the present day structural high and it shows poor to moderate porosity development, but it does not show any commercial hydrocarbon accumulation. Seismic inversion and porosity modeling study suggest that the best-developed reservoir zone is away from the present day structural high. To gain a better insight of porosity development in the area, paleo structural analysis was carried out. The analysis was done by carefully selecting key horizons and generating isopach maps to get a paleo structure maps. Paleo structural analysis shows that the best porosity has been developed over paleo structural high axis. Seismic inversion and porosity modeling study was found to be a useful tool to delineate reservoir facies. Paleo structural analysis has helped in understanding that better developed porosity zone is associated with the paleo high axis of that level. The integrated workflow has led to the identification exploration opportunities with a higher degree of confidence.