Jurassic Fault Framework and Trapping Mechanism over Medina-Arfajiyah-Rehaze Corridor, Kuwait

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SUMMARY

Jurassic discoveries in Kuwait during recent years have met with potential successes. Especially recent successes in Rahiyah-Umm Roos in SW Kuwait and Bahrah in immediate vicinity of the present study area are of special significance and it attracts new exploratory targets in surrounding area.

Middle Marrat and Najmah/Sargelu Formations within the Jurassic are main recognized reservoirs with proven hydrocarbon in Kuwait. Middle Marrat in the present study area is mostly of mud prone facies in a mid ramp to outer ramp setting having relatively low matrix porosity. Therefore, hydrocarbon potential and productivity of Jurassic reservoir dominantly depends upon connectivity of open fracture network.

To evaluate this fracture efficiency and favorable hydrocarbon traps, the structural style of Medina-Arfajiyah-Rehaze and its fault framework were analyzed through detail mapping of the area. The study focuses on seismic mapping of 800 Km (onshore/offshore) 2D seismic data within Jurassic reservoirs (Middle Marrat and Najmah Shale Formations) over Medina-Arfajiyah-Rehaze Corridor, NE Kuwait. The interpretation also incorporated 3D and 2D seismic data and 4 available Jurassic wells from adjacent area to evaluate the structural play.

A total of three horizons were mapped that showed well-defined N20-25oE trending structure plunging toward NE. This feature which is referred as the Medina Corridor is recognized from Kuwait Bay and extends towards the study area. Additionally, two major fault trends, one in NNE-SSW direction and the other in NW-SE direction were identified. The NNE-SSW trend can be related to the regional compressive stress for the area and the NW-SE trend is associated to re-accommodations of the structures.

Five structural traps were identified in this corridor. The prospectivity of the study area is linked to the fault sealing capacity of NNE-SSW and NW-SE faults trends which compartmentalize the structure and create multiple structural segments. The presence of intense faulting and high curvature also infer adequate fracturing over the area that brings these identified traps as major exploration target.