

Integrated Prospectivity Analysis of Late Jurassic Hith and Gotnia Formations in Umm Niqa Area – North Kuwait

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ABSTRACT

Evaporitic sequences of Late Jurassic Hith and Gotnia formations have not been considered as prospective reservoirs for long, owing to their complex lithology and sparse petrophysical information. Recent discovery of hydrocarbons from these formations in Raudhatain field of North Kuwait has validated the presence of active petroleum system in these sequences and kindled exploration interest in thin overpressured limestone layers interbedded with anhydrite units. Umm Niqa is a northwesterly dipping structure located northeast of Raudhatain Field in North Kuwait. An integrated study using 3D seismic and drilled well data is carried out for evaluating hydrocarbon prospectivity of Hith and Gotnia formations in this area. Detailed 3D seismic structural interpretation brought out NW-SE trending oblate, northerly plunging anticline structure from Najmah to Gotnia 2nd Anhydrite levels. At younger stratigraphic levels, the trend unifies with broad Sabriyah NNE-SSW trend and continues to plunge towards north. Strong NW-SE faults separate Umm Niqa area from Sabriyah field generating several fault blocks. Structural disposition of different Gotnia sedimentary units are mostly influenced by underlying Najmah structure and halokinetic effects. Wells drilled in Umm Niqa structure indicate fair to good gas shows on mud logs even though drilled with high mud weight to counter high formation pressures. Well log correlation indicates development of three cycles of salt-anhydrite units in Gotnia formation. Carbonate layers in Hith and all three Gotnia anhydrites show presence of good to moderate porosities. Faults and associated fracture corridors are identified by coherence and other supportive attributes in studied area. Spatial distribution of carbonate facies is achieved by mapping reservoir units using well data constrained by structural trend. Petrophysical evaluation of recently drilled wells show hydrocarbon presence on logs with higher oil saturation. Better reservoir quality is expected around the margins of subtle depositional highs in shallow marine inner ramp setting. The integrated study brought out prospective limestone layers in all three Gotnia anhydrite units as well as established the hydrocarbon prospectivity in Umm Niqa area.