

The Stratigraphic Traps of Najmah Formation in Kuwait

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ABSTRACT

The Najmah Formation (Callovian – Kimmeridgian) in Kuwait is represented by highly variable lithologies – hence a wide range of reservoirs & system traps is present. The sediments comprise first the organic-rich limestones that represent deposition in an anoxic outer ramp to basin environment. They are contemporaneous with important Oceanic Anoxic Events (OAE). These OAE are associated with major flooding events of Jurassic time in many areas. The organic-rich limestones, formed during transgressive systems, are a major source rock in the Gotnia Basin. The wide range of platformic clean limestones (Folk classification) forms several cleaning-upward cycles. The base of the Lower Najmah Formation is assigned to the first appearance of carbonaceous limestones above a major hardground surface (sequence boundary). A disconformity marks the junction between the Najmah and the overlying Gotnia Salt. Najmah Formation in Kuwait is represented by highly variable thicknesses. Towards the South (250 to 400 ft.) the Formation division is complex due to several grain flow units within Middle Najmah Member. Based on distinct predominant lithologies it is divisible into five units, whereas in the North (150 ft.) the formation has four units. The Gotnia Basin formed during one of the later extensional phases associated with formation of the Tethys & believed to form a system of highs & lows oriented NW-SE.

When tectonically structured (transpression), all the range of this diverse lithologic strata form Anticlinal Traps and are good reservoir. Porosity is present mostly as fractures in the clean limestones, but the carbonaceous limestones can act as both source and reservoir locally. The Organic-Rich Limestones; a major source rock in the Gotnia Basin can be a Hot Spot Reservoir and Trap based on the new concepts of reservoir & trap classification.

In the South the Formation division is complex due to several Grain Flows & Turbidite units deposited as submarine fans at the toe of the slope, and submarine channels away from the slope. They are the object of this study. They form Stratigraphic Traps in the depositional regime; where geometric arrangement of the facies results from depositional processes. In our case the facies changes happens between the reservoir mentioned above, surrounding rocks, and the seal (organic-rich tight limestone).

So, the Submarine Fans represent Regional Depositional, Relief (subclass), Deepwater marine carbonate reservoirs (Grain Flows Reservoirs). The Turbidite channels represent Local Deepwater marine carbonate reservoirs (Turbidites Reservoirs). The channels are believed to follow the inherited lows (valleys) explained above. The advent of gas shales Traps & Reservoirs indeed requires a revision of the present Trap Classification Theory.