Integrated Charge Evaluation of a Prospect in South Oman Salt Basin

Sabra H. Al Shaqsi[1], Mohamed Al Ghammari[1], Bushra Al Mamari[1]

[1]Petroleum Development Oman

Abstract

WX West is a mature prospect in South Oman Salt basin, targeting Al Khlata P5 sand as main reservoir and Gharif as secondary. All play elements are proven to work from the wells and fields surrounding the opportunity.However, prospect is in a high charge risk area due to the presence of thick salt beneath the structure.

A well was drilled recently to unlock this prospect. The well was found dry with no evidence of any hydrocarbons, and all pressure points plot on a water gradient. The initial understanding suggests that trap geometry is present as 3 Way Dip Closure but most likely it hasn't been charged due to thick salt beneath and/or charged and leaked via the fault.

Additionally, the mudgas didn't show any evidence of charge, the gas responses across the entire well were very low and do not exceed background gas levels (<0.1%), and there was no gas captured in the isotube.

Further dry hole analysis was done to better understand the failure reason of the prospect and the petroleum systems in the region, which eventually can help high grade present and future prospects in the vicinity of the well. Fluid inclusion stratigraphy was carried out across the entire well stratigraphy, to track any records of paleo- hydrocarbon presence that is trapped within the micron-scale pores or in mineral inclusions of the reservoir.

The investigation was performed on 91 cuttings samples from 70-1200 m (samples were available every 10 m) and augmented by thin section analysis from hydrocarbon enriched zones as detected by FIS.

Micro shows were evident in several intervals from Damam to Top of UER Middle (70 m to 380 m) and from Top Rahab to the well TD in Al Khlata (900 m to 1200 m). The highest hydrocarbon responses occur at 1180-1200 m in Al Khlata P1 and P9, and fluid inclusions were visible in thin sections at 1080 m (Al Khlata P1) and 1190 m (Al Khlata P9). By integrating Microthermometry and basin modelling, multiple charges of hydrocarbons might have been present in Al Khlata with an early charge (293-299 Ma) during the reservoir/seal deposition which could have led to lack of retention. Later hydrocarbon charges might have entered the trap around 147-150 and 90-104 Ma and did not accumulate most likely due to fault presence that might have caused the hydrocarbons to leak – However, large uncertainty still exists around the exact timing of the hydrocarbon charge due to the large error bars around Microthermometry.