Unayzah Formation in Subsurface Kuwait – Implications for Deep Play Exploration

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Permian-Carboniferous Unayzah Formation hosts prolific oil, gas and condensate reserves in the Arabian Peninsula and is of great exploration significance. The formation was recently encountered for the first time in deep exploration wells in North Kuwait.

Conventional and sidewall cores from these wells were studied. Stacked conglomerate and sandstones are developed in the lower part of the formation. In the middle, several stacked fining upward fluvial sequences, consisting of medium- to coarse-grained sandstones, are developed. The sequences are capped by red mudstone paleosole horizons. These sediments were deposited relatively proximal to the source where ephemeral flash braided streams were developed possibly due to seasonal melting of ice. The upper part of the formation consists of three cycles of well sorted fine-grained quartz arenites separated by a series of bioturbated and rooted sandstone-siltstone and locally black carbonaceous shales, deposited in coastal plain setting. The overlying “Khuff clastics” consists of transitional to shallow marine fine-grained sandstones with locally developed dolostone beds merging upward into carbonate succession of Khuff Formation. Pre-Khuff unconformity is not clearly demonstrable while the pre-Unayzah unconformity is well developed.

The porosity in the formation is highly variable and is largely facies dependent. It is better developed and preserved in coarse-grained facies where clay coating on grains has impeded cementation. The interbedded paleosoles and basal part of the Khuff Formation could provide local and regional seals for the expected hydrocarbon accumulations in the formation. These observations have important implications for deep gas exploration in Kuwait.