Stratigraphic Analysis and Hydrocarbon Potential of the Unayzah Formation (Lower Permian), Qatar

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ABSTRACT

The Unayzah Formation has been introduced in the Saudi stratigraphic system to cater for the Upper Carboniferous – Lower Permian Pre-Khuff Clastics. It consists of sandstone, shale, and thin beds of limestone and evaporites. It was suggested that the formation reflects a transition from glacial and post glacial to shallow continental margin settings. In Qatar, only few wells had penetrated this formation and this is the first detailed analysis based on cores, well logs and data from three wells in Dukhan and Matbakh fields. The Unayzah Formation (of lower Permian age in Qatar) consists of three major sandstone members UN1-UN3. These are formed of cross-bedded, fine-grained to pebble-bearing sandstone containing a considerable amount of plant remains, lignite and iron oxides. The formation also consists of argillaceous limestone, siltstone and shales with some anhydrite mainly at the upper part just below the Khuff Formation. The sediment lithology and association reflect a major change from continental to marine conditions. The high content of plant remains and lignite indicate that the transgressive phase "ripped" through a relatively calm braided river system after receiving coarser clastic input as reflected by the pebbly contents and the cross-bedding structures. This evolved eventually to a wide-scale transgression that deposited the carbonate sediments of the Khuff Formation. There are no indications of glacial sediments in the studied wells. This may due either to the lack of enough materials or that Qatar was outside the glacial zone then. The Unayzah Formation is an important hydrocarbon reservoir in many of the Saudi eastern and southeastern fields. The potentiality of the formation as a reservoir in Qatar is not fully investigated. Most of the porosity is moldic resulted from the dissolution of calcite cement and feldspar. There is a considerable vertical variation in the poroperm values of the formation. Average porosity is around 8% but higher values of up to 17% were recorded. Variation in permeability is more conspicuous and it ranges from 5 to 530md. The present data suggests that there are some potential exploration targets within the Unayzah Formation in the studied wells but there is a need for more wells to be drilled and investigated.