Petrophysical characterization of the Cretaceous-Paleocene succession, Tal-Block, Kohat sub-basin, North West Pakistan

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Abstract

The research work deals with the evaluation of the reservoir potential through petrophysical analysis of the Cretaceous – Paleocene rocks in three wells of Tal block namely, Kahi-01, Sumari deep X-01 and Mamikhel-01 well in the Kohat sub-basin. Two formations namely, Hangu and Lumshiwal formations have been analyzed in detail.

Lumshiwal Formation has a thickness of 133 m in Kahi-01 well. A single zone A is marked within the Lumshiwal Formation in Kahi-01 well. The interval display a higher value of effective porosity and lesser value of volume of shale.

In Sumari deep X-01 well, Lumshiwal Formation has a thickness of 122 m. Three zones, C1, C2, and C3, 10, 30 and 35 m thick, respectively, have been marked. Overall, the complete formation proves to be a good reservoir with satisfactory porosities and hydrocarbon saturation values in Sumari deep X-01 well. Lumshiwal Formation is encountered twice in Mamikhel-01 well. The log interpretations show that the formation is clean with lesser volume of shale, high effective porosity, and high water saturation. The Gas effect approves the reservoir capabilities of the Lumshiwal formation in Mamikhel-01 well.

The thickness of Hangu Formation in Kahi-01 well is 50 m. A single zone B is marked as potential reservoir interval in Hangu Formation which occurs at depth 1705 - 1730 m. The Formation has significant values of effective porosity, less volume of shale and greater hydrocarbon saturation confirms the reservoir potential of Hangu Formation in Kahi-01.

The bulk volume of water data suggests coarser grained rocks for Hangu Formation in Sumari deep X-01 well. The effective porosity and hydrocarbon saturation values determined are unsatisfactory.

Hangu Formation in Mamikhel-01 well is 19 m thick. The water saturation value is high but the Formation has satisfactory values of effective porosity and volume of shale.

By correlating the reservoir intervals from the three wells i.e. Kahi-01, Sumari deep X-01 and Mamikhel-01 wells, it is inferred that the overall reservoir capability decreases to the west but increases to the north

Sequence stratigraphic analysis has showed two types facies association in Lumshiwal Formation and three types of facies association in Hangu formation. The analysis based on GR log determines an inner to middle shelf environment for Lumshiwal Formation and deltaic environment for Hangu Formation.