

THE IMPACT OF DEPOSITIONAL-CUM-DIAGENETIC FABRIC AND SEQUENCE STRATIGRAPHY ON SHALLOW MARINE RESERVOIRS: AN INSIGHT FROM LOWER CRETACEOUS SEDIMENTS OF THE UPPER INDUS BASIN, PAKISTAN

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Abstract

The Early to Middle Cretaceous Chichali and overlying Lumshiwai formations from the Upper Indus Basin, Pakistan have been investigated to link the reservoir quality with stratal deposition, diagenetic modifications and sequence stratigraphy. The Chichali Formation revealed laterite, glauconitic sandstone and carbonaceous green shale lithofacies, representing middle to outer ramp depositional environment. The presence of bioclastic sandy limestone, quartz arenite and glauconitic sandstone lithofacies within the overlying Lumshiwai Formation showed an inter tidal to inner ramp depositional settings. The calcite, hematite, smectite, ferroan dolomite and glauconite occurred as cement in the coarse grained lithofacies of the Chichali Formation, thereby reducing the porosity, however, grain fracture porosity, and dolomitization, intergranular and dissolution porosity resulted in increase in the porosity. The overlying Lumshiwai Formation showed both physical and chemical compaction, authigenic mineralization, cementation, and late-stage dissolution. The dominant cement types in the Lumshiwai Formation are calcite, ferroan dolomite, smectite, illite and quartz-overgrowth cements. The primary intergranular porosity and late-stage diagenetic dissolution- and dolomitization-induced secondary porosity added to the reservoir quality of the Lumshiwai Formation. The sequence stratigraphic analysis revealed that Chichali Formation is deposited during transgressive system tract of 2nd order depositional cycle. The transgression-associated glauconitic sandstone lithofacies of the Chichali Formation acts as a good reservoir within the formation, which is bounded by carbonaceous green shale associated with maximum flooding surface. The Lumshiwai Formation is deposited in the regressive 2nd order cycle. This regression is represented by the intertidal lithofacies. The quartz arenites in the intertidal lithofacies bears excellent reservoir potential.