Reconstruction of the Depositional setting of an Early Oligocene Siliciclastic Reservoirs in the Tapti Daman Sub Basin: An integrated study using Borehole Images

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This case study aims at establishing the depositional setting of siliciclastic deposits of Early Oligocene age (Mahuva formation) in the C-39 area, Tapti Daman Sub Basin, Western Offshore Basin, India. This area has been selected as it has full complement of well logs augmented by good quality electrical image data, which provides some critical insights regarding the depositional environment and reservoir complexity. The area also happens to be hydrocarbon rich with multiple reservoir sections.

The formation encountered in this study area comprises of sandstones, siltstones and shales. The variation in thickness and lateral continuity of the reservoir units is characteristic of this formation, which amplifies the uncertainty in resolving the geometries of the sand units with respect to the depositional environment. In order to minimize the uncertainty and establish the depositional setting, an integrated multiwell technique was used that includes sand dispersal patterns, texture analysis and eliciting the sand depositional genesis using borehole microresistivity images integrated with core and other datasets.

The interesting feature of this deposition is found to be a conglomeration of different sequences evolving as the sea receded gradually. The entire sequences traversed by different wells comprises of two subdivisions with respect to the depositional architecture. In the upper part, estuarine depositional sequences is marked by periods of exposure or very low bathymetry; reaching out to subaqueous channels and bypassing to the deeper part of the subtidal regime cutting across the estuarine deposits in some cases. Superposition of tidal and mouth bars deposits are characteristic of the upper part of the sequence. The lower part is distinguished by its nature of wide prevalence of highly bioturbated shale, silt and sand sequences that is interpreted to be driven by splay progradation. This is also evident from the homogeneous aerial distribution of the sand units within the lower part of the sequence. The study also revealed that the essential sand dispersal direction is towards S-SW. Variation in dispersal pattern was inferred to be due to tidal/longshore current reworking.