Modelling Fluvial Sandstone Architecture in a Mature Oilfield of Upper Assam Basin using Old Geophysical Logs

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Summary

Discovered in the mid 1950s, Zaloni oilfield in Upper Assam basin is today a mature oilfield being managed by Oil India Limited with the reservoirs being primarily confined to formations (Barails) of the Oligocene age. These fluvial reservoirs consist of a series of multistory and multi- lateral channel sandstones with associated overbank sediments. The degree of channel amalgamation decreases as the rocks get younger passing from what is essentially a sheet sand in the Barail Arenaceous unit into more isolated disparate channel sand bodies within the overlying Barail Argillaceous unit. In the absence of any apparent reliable marker on the reservoir scale, a sand to sand correlation scheme had been followed. This "layer cake" approach led in many cases to the bridging of structurally equivalent but unconnected sand bodies with different fluid types and pressure production characteristics or the necessity for imposing barriers which did not always conform to geologic reality. This became readily apparent when attempting to model the sandstone architecture in 3D during a recent a study carried out to identify remaining potential, if any, in the Zaloni field. Therefore as a prelude to the study, for the identification of the hydrodynamic flow units within the reservoir zones, a very robust correlation scheme became necessary. Conventional core data being very limited in the field the only recourse was to utilize the available suite of wireline logs.

Most of the wells in the Zaloni oilfield have old, incomplete logging suites and the ability to use the old logs was critical to the correlation and characterization of the reservoir interval in this mature field. Preceded by sedimentological analysis of the limited core data, a petrophysical study helped to identify log responses, signifying chrono-stratigraphic markers correlative to changes in relative sea level, within these old logs that were correlated over large parts of the fields. The consistency of the correlation was checked against the fluid distribution pattern followed by subjecting the reservoirs to Material Balance calculations to identify any significant discrepancies. Geophysical attribute data was then used to recognize the lateral extent of the reservoirs thus identified. The approach has culminated in the identification of unswept oil in the field and in the first phase of operations has yielded an additional production of around 600 BOPD from this mature field.