Flow Unit Mapping in Fluvio-Lacustrine Settings, a Multiproxy Approach

Arnaud Fournillon[1], Stefan Doublet[1], Baptiste Auffray[1], Guillaume Suzanne[1], Aurelie Bonnel[1], Brian Horn[2], Abaan Ahmed[2], Arjun Tiwari[2], Ruchika Sharda[2], Alok Kumar[2], Gaurav Sharma[2], Joyjit Das[2]

[1]Beicip-Franlab
[2]Cairn India

Abstract

Fluvial depositional environments represent a key challenge in reservoir modeling. They are characterized by highly complex reservoir architecture combined with high sedimentary heterogeneity. The first member of the Fatehgarh Formation in Mangala Field (Eocene from Rajasthan, India) is typical of such fluvio‐lacustrine settings. It has a meandering system identified on both seismic and core data associated to a complex fluid flow behavior. This fluid flow exhibits preferential pathways, small dynamic compartments and thief layers. The present study shows how flow units have been characterized in this field through an interdisciplinary approach. Mangala Field is particularly suitable for such study as it has a very high well density, and an extensive geological and dynamic database. The multiproxy approach defined here for the flow unit mapping relies on a close integration of stratigraphic, sedimentological, geophysical and reservoir engineering analyses. The applied workflow begins with the definition of a stratigraphic datum. In this case, it corresponds to the onset of lacustrine-dominated environment atop of the fluvial system, which can be tracked on widely available density logs. Using this datum, several assumptions of stratigraphic packages were evaluated for their consistency with core features (*e.g.* thick paleosoils, shale packages ⋯), seismic stratigraphic interpretations and vertical compartments identified from MDT data. From this method, four stratigraphic packages have been interpreted. In each package, dynamic information is summarized under a synthetic well log considering available injectivity (ILT) and flushing indications from RST logs. This dynamic information is completed by the study of water breakthrough timings combined with seismic geomorphology and well log pattern. All these different steps result in the definition of a set of connected flow units, called here geobodies, within each stratigraphic package. These flow units were subsequently used to analyze oil saturation variation through time. They highlight the strong adequacy between saturation pattern at well and interpreted flow units. The latter allow a spatial representation of the remaining oil distribution driven by these geobodies.