

Characterization of an Unconventional Complex Clastic Reservoir through Log & Core Data to Facilitate Future Exploration and Development Activities leading to Production Augmentation - A Case Study

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The reservoir in this study lies in the Cambay basin of Western onshore India. Unlike other prolific reservoirs in this basin, this reservoir has poor characteristics due to presence of thick sideritic shale, thin carbonaceous laminae, thinly laminated siltstone and very fine grained sandstone reservoir facies with thin shale laminations. In general the porosity development is poor due to higher argillaceous contents and also destruction due to sideritization and precipitation of authigenic clays. The permeability of the reservoir is towards lower side and as a result, most of the wells need hydrofracturing for activation.

The conventional approach of identifying the reservoir quality from logs does not apply in this reservoir due to its complex nature. The complexity can be gauged from the fact that more than ten minerals have been reported in these fields by various core studies. Therefore innovative techniques have been drawn to identify facies based on Gamma Ray-Deep Resistivity Overlay, Neutron-Density separation, SP and CMR logs. The facies thus identified are validated by testing results, permeability, core capillary pressure and flow-unit data.

As it is impossible to solve for volumes of all the existing mineral with only conventional logs, an innovative approach with quartz, clay and aggregate of secondary minerals has been adopted for the quantifications of the volumes through ElanPlus. The output results of Elan are validated with the available core data and also with effective porosity of CMR log, wherever available.

The main outcome of the study is identification of the suitable areas for the drain hole placement, prospective areas for future exploratory / development activities and existing stress direction orientation based on FMI orthogonal caliper break out analysis. In view of this analysis, horizontal drain-holes are recommended to be placed in North-South direction (along minimum stress direction) and hydro-fracturing jobs in conventional wells are suggested in East-West direction (along maximum stress direction) to enhance the oil productivity.