

An Integrated Approach to Reservoir Characterisation and Evaluation of Complex Reservoirs in Upper Assam

Deepak Kapoor, Sarvesh Mallik, and Kalika Prasad

Logging Group, KDMIPE, ONGC, Dehradun

dkapoor62@gmail.com

Reservoir characterization is a process for quantitatively assigning reservoir properties, recognizing geologic information and uncertainties in spatial variability. For the evaluation of hydrocarbon reservoirs and realizing their maximum potential, reservoir characterization holds the key. Core analyses along with study of log attributes are the tools which are helpful for the proper reservoir characterization. Without proper reservoir characterization, the evaluation of such reservoirs may lead to erroneous interpretation results, including the possibility of missing of some very good hydrocarbon reservoirs.

The Tipam and Barail formations of Assam and Assam-Arakan basin in Upper Assam are established hydrocarbon producers. The availability of new generation wire-line logs such as Natural-Gamma-Ray, Litho-Density, has helped in better understanding of these reservoirs. Analysis of the log data along with the geological data has indicated that these reservoirs are heterogeneous in nature. X-plots generated in BMS-BCS and Tipam formations have aided in identifying and characterizing the reservoirs. Distinct alignments of distribution of the data points on these plots have helped in inferring the reservoir quality. Sedimentological studies carried out on cores of these formations have shown their complex nature as they have varying porosity distribution and minerals such as Mica, Feldspar and clay minerals like Montmorillonite, Kaolinite, Chlorite and Illite.

The presence of these minerals along with their mode of deposition complicates log interpretation considerably, as it affects the porosity, permeability and the general reservoir character. Infact, in some formations notably LBS formation of Laiplingaon field and BMS and BCS formations of Geleki periphery area, the actual producibility of the reservoirs is not consistent with the interpreted results. It appears that in some of these cases the reservoir character is poor. The actual reason is explained by the proper reservoir characterization of these formations, which shows that in most of these cases, the presence of authigenic Kaolinite as pore filling clay mineral is noticed. This greatly reduces the porosity and permeability. Also Quartz overgrowths are seen within the pores along with interstitial Biotite mineral. These have adverse effect on porosity and permeability of reservoir rocks, thereby affecting their producibility.

This paper discusses an integrated approach for the reservoir characterization and evaluation of complex hydrocarbon sandstone reservoirs for their optimum exploitation. Results of log analysis and core studies have been integrated to arrive at a representative model, for interpretation based on inverse modeling technique. The proper reservoir characterization has helped in better understanding of the reservoirs and in realizing their maximum potential. The results obtained after evaluation of key wells with this interpretation model have been found to be in better agreement with the reservoir character.