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Formation Evaluation of a Volcanic Reservoir: Barmer Basin, India.

Petrophysics of volcanic and volcanogenic sediments is one of the most challenging tasks that can face a technical team. It is particularly important in the Indian subcontinent as there are a number of volcanic plays that contain hydrocarbons. This paper presents a petrophysical methodology that is robust and draws on the strengths of the various logging suites in particular the density and nuclear magnetic resonance (NMR) logs.

Density porosity is calculated using the total porosity of the NMR as a guide. Effective porosity is estimated by subtracting the NMR clay bound water from the total porosity. Permeability is determined from the effective porosity and utilizing core based porosity-permeability transforms. Finally, water saturation is derived with a saturation height function modeled on the Skelt methodology.

The results are checked with the reality of gas shows from the mudlog, and permeability derived from both well test and hydraulic fracture stimulation data.

Modern NMR data is compared with legacy data and the drawbacks of using free fluid porosity values in gas reservoirs is presented. Pore throat comparisons are made to tight gas and shale gas reservoirs elsewhere in the world.

It is hoped that the techniques discussed in this paper will assist other technical teams to improve the evaluation of volcanic reservoirs thereby unlocking the large potential of this unconventional resource.