

Log Analysis of Legacy Marcellus Borehole Logs

J. Ward, PetroEdge Resource Partners

Regional mapping of facies within the Marcellus Shale in the Appalachian Basin in the early phase of drilling the formation depends on the availability of good quality borehole log data sets and applicable software for evaluation. PetroEdge Resource Partners LLC. embarked on a regional study of the Marcellus to locate areas for lease acquisition in late 2006. Public log data bases in New York, Pennsylvania, and West Virginia were reviewed for neutron, density, gamma ray, and photoelectric logs. When these logs were supplemented by proprietary logs, the result was a data set that is sparse, but suitable for regional facies mapping. The search for analysis software started with published equations developed by the Gas Research Institute in the early 1990's. The algorithms, developed and published by the GRI, were modified and adapted for application to the Marcellus Formation. One critical modification of the programs involved calculation and application of varying kerogen density based on log crossplots. Comparison of log derived kerogen density maps, or R_o derived from kerogen density, are a close match to laboratory measurements of these variables. Uniform application of the programs and pay cutoffs converted the regional image log data set into a digital database with calculated volume of silt, heavies, kerogen, and clay. Using standard cutoffs, the pay volume was derived for all wells that had resistivity logs. Maps of individual variables, or combinations of the variables allow the construction of regional facies maps. These facies maps serve to illustrate regional depositional characteristics of the Marcellus Formation. They also serve to explain the regional changes in the relationship between gamma ray deflection and apparent porosity on neutron and density logs. Lastly, the maps provide important clues concerning the distribution of gas in place in the Marcellus.