

High Resolution Spectral Gamma Ray Log (HRSGR): Applications for Unconventional Reservoirs

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The development of a high resolution spectral gamma ray logging procedure for use with conventional whole core provides detailed definition of geochemical and geological data in unconventional reservoirs, such as the Marcellus, Haynesville, and Barnett Formations. Increasing the spectral gamma ray sampling rate from the industry standard of two measurements per foot to five samples per foot provides superior data quality that is used to show small-scale changes in the amounts of potassium, thorium, and uranium, which serve as proxies for lithology and organic content (TOC) in thin bedded to thinly laminated sequences (centimeter to millimeter scale bedding). High resolution data provides detailed stratigraphic information that can be used for interwell correlation to field-scale correlation of otherwise non-correlatable units. In addition, by identifying potentially organic-rich zones in otherwise homogenous appearing rocks, the high resolution spectral gamma logs can also be used as a screening tool for geochemical sampling and analysis, resulting in high quality data from fewer samples. Geological events are also readily identified, such as phosphate-rich zones, storm beds, and fining-upward or coarsening-upward sequences. High resolution spectral gamma data has become an essential part of complete core analysis protocols for the interpretation of unconventional reservoirs.