

Core-log integration for advanced evaluation of oil shale formations: Green River case study

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Conventional well logging and interpretation workflows have been developed mainly for use in porous and permeable formations and are not commonly used to evaluate source rocks or unconventional reservoirs. Instead, the evaluation of oil shale has relied primarily on expensive and inefficient core analyses such as the Fischer Assay, and on primitive log interpretation techniques. With the potential oil equivalent in place exceeding a trillion barrels, there is a need for detailed characterization of oil shale deposits by using modern well logs. We logged two Green River wells, and carried out extensive core analysis, including Fischer Assay, and thorough mineralogical and chemical analyses. We developed methods for quantitatively evaluating the Green River oil shale by integrating standard logs with more advanced logging measurements including magnetic resonance, elemental capture and inelastic spectroscopy, and dielectric dispersion. The log interpretation results and the petrophysically derived mineral model were validated by the core measurements. Methods of determining kerogen content from log responses were developed, along with multiple methods of estimating a continuous log of formation water salinity.