Automated Well Log Conditioning for Petrophysical Interpretation

Malleswar Yenugu, Russell Roundtree
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Abstract

Geologists and Petrophysicists very often observe that well log curves from neighboring wells do not necessarily have the same curve values in stratigraphic units that are believed to have nearly identical rock and fluid properties throughout an area or field. Well log normalization is based on the concept that maximum and minimum readings in a geological formation in an area should have the same log readings. This becomes more difficult and challenging as these logs are acquired by many vendors and of widely different vintages. Well log conditioning is needed before quantitative comparisons and reservoir property estimations can be made from such diverse data. Hydrocarbon exploration and production can benefit from well log normalization. Corrected log curves are required to produce robust property estimation and better correlation results. This is especially useful in lithologically consistent intervals (conventional or unconventional) with reservoir properties like porosity, saturations, TOC, etc. This well log normalization technique involves re-calibration of primary log measurements (GR, RHOB, DT and NPHI) to an agreed reference using one or two-point calibration histogram techniques. The zones that have similar geological/rock properties in an area or field are used for the calibration process. Prior to the normalization process, the log data undergoes preliminary log editing processes like curve standardization (aliasing), depth alignment, etc. Then automated quality assessments detect and replace poor quality sections with pseudo-curves. Normalization of the well logs is a tedious and time consuming. We are presenting a new automated approach for well log normalization. This method estimates different statistical methods (mean, mode, standard deviation) of the histograms of the curves for all the wells. It identifies the maximum number of wells that have similar range of values for a geological formation. This method

identifies outlier wells and shifts their histograms automatically. We believe that this automated approach will reduce the time involved for well log normalization significantly which is vital for an integrated reservoir characterization workflow.