Improving petrophysical interpretation through statistical log analysis and rock physics modeling

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Uncertainties in the quantitative interpretation of well log data are often unquantified and ignored. Uncertainties are always present to some degree and have many underlying causes such as quality of log data, lack of calibration data, choice of petrophysical model, choice of model parameters. Understanding the nature of reducing the uncertainties is important if the petrophysical results are to be used for reservoir characterisation, reservoir modelling or risk analysis.

Statistical petrophysical techniques provide a means to assess the sensitivity of the interpretation to model and model parameter choice and to include known or assumed uncertainties in the measured data. To reduce uncertainty additional information must be introduced such as multiple well data or rock physics constraints. Parallel interpretation of multiple wells can increase the signal to noise ratio of the interpretation and at least ensures greater consistency of interpretation between the wells. Rock physics provides a link between the standard petrophysical properties and any measured elastic properties of the formation and therefore can provide an additional constraint on the petrophysical interpretation. An extra advantage of integrating a rock physics model is that, since elastic properties can be estimated from seismic data, the petrophysical interpretation can be interpolated between wells more accurately using seismic data as a guide.

This paper highlights how statistical log analysis, parallel interpretation of multiple wells and the integration of rock physics constraints can reduce uncertainty in petrophysical interpretation in cases of bad hole and complex lithology.

Technical Area: Formation evaluation/Petrophysics/Borehole geophysics

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