

Interactive Petrophysics

Advanced modules

WHAT IS INTERACTIVE PETROPHYSICS?

Interactive Petrophysics™ log analysis software is fast, efficient, PC-based software for reservoir property analysis and summation. It is a portable, quick, versatile, and easy-to-use log analysis software ideal both for the geologist wanting to quality check log data and for the experienced petrophysicist carrying out multizone, multiwell petrophysical field analysis.

Interactive Petrophysics uses easily understood deterministic calculation models to calculate porosity, water saturation, shale volumes, and other properties within user-defined zones. Parameters and crossplot end points are picked directly on the plots, significantly minimizing keyboard entry. As parameters are selected from the log plots and interactive crossplots, analysis results are instantaneously updated.

A summation report is also instantaneously updated with each step in the analysis. A complete log analysis that previously took hours to perform is reduced to minutes, aided by the industry's only Monte Carlo sensitivity analysis available on the PC and the following advanced analysis features:

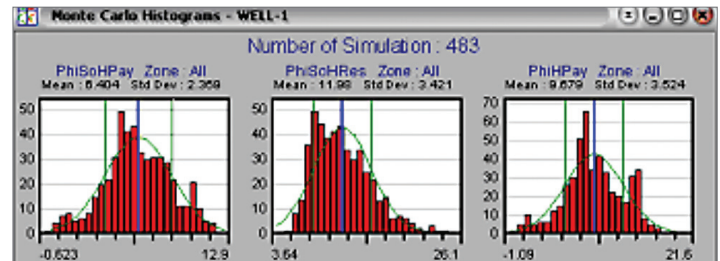
- Missing curve and facies prediction using fuzzy logic

- Monte Carlo simulation of petrophysical analysis, including tornado plots
- Rock physics
- Elastic impedance determination
- Nuclear magnetic resonance (NMR) interpretation

LOG ESTIMATION USING FUZZY LOGIC

Fuzzy logic is used to predict missing log curves or facies and carry out a multiwell study. It uses continuous log curves or discrete facies information—from core or other sources—in a key well (or wells) as the input. Curves are selected in a well that has a complete set of the log or facies data that must be estimated in other wells.

The training set is processed using fuzzy logic to determine the most likely value for various combinations of log values that represent the missing log or facies data. The set of predictive values is then applied to the wells missing data to estimate the most likely values of log or facies data.



Monte Carlo histograms.

MONTE CARLO SIMULATION FOR PROBABILITY ANALYSIS

The Monte Carlo Analysis module uses Monte Carlo simulation to estimate errors in a petrophysical analysis. After the user enters the distribution of possible errors in the interpretation parameters and input curves, the program randomizes the input parameters—porosity, saturation, Vshale—based on user-selected ranges. Numerous passes—hundreds to thousands—can be defined through the Interactive Petrophysics analysis modules.

Using the randomly selected reservoir properties, the results for each analysis are accumulated and displayed in histograms, crossplots, and tornado charts. The sensitivity of net and gross reservoir summations to changes in parameter settings is tested by this technique and allows you to optimize the cutoff values used to produce the final reservoir summation.

ROCK PHYSICS MODULE

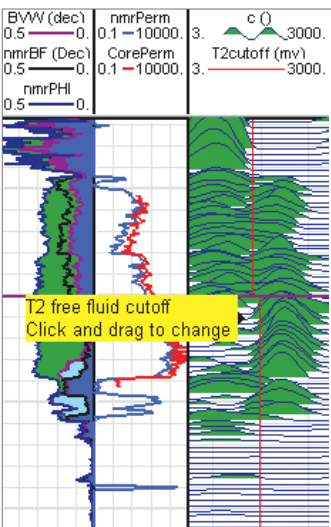
The Rock Physics module includes shear sonic, fluid substitution, and elastic impedance analysis. A synthetic shear sonic curve is generated from the compressional sonic using the Greenberg-Castagna model. The module can also be used for quality control of the shear sonic curve to ensure that it is not a mud wave or stonely wave velocity produced by bad processing of the sonic waveform data.

Developed by PGL
www.pglweb.com





Revolutionize your petrophysical workflow using the wide range of Interactive Petrophysics advanced modules.



NMR results with T2 cutoffs.

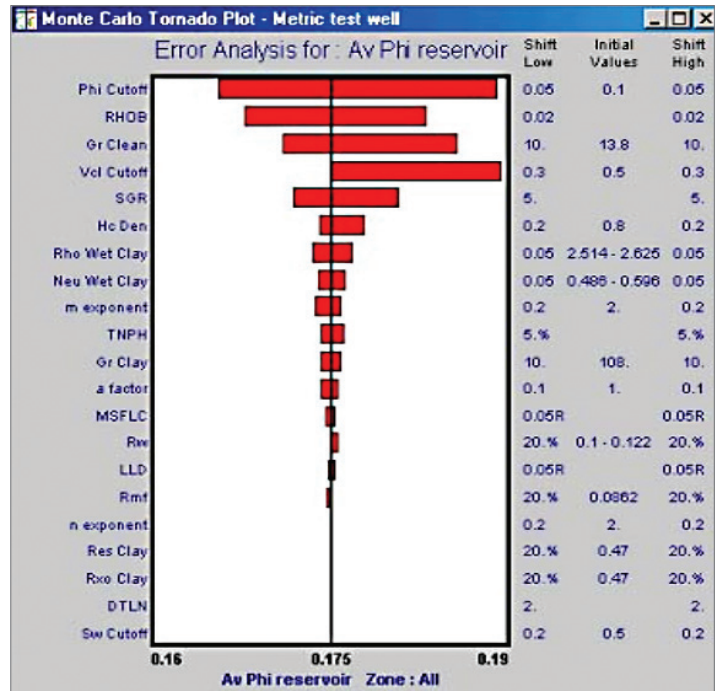
Interactive Petrophysics uses the Gassman equation to investigate the validity of fluid and matrix properties with respect to input velocities and petrophysical parameters for average zonal properties, as well as for rapid evaluation of the effects of fluid substitution. The input data are inverted for dry rock parameters using the Gassmann equation.

ELASTIC IMPEDANCE (EI) MODULE

Elastic impedance can be computed as calculated by P. Connolly in the *The Leading Edge* paper of 1999. The equation calculates high-angle inversion. The EI module requires the input of V_p , V_s , and density curves with appropriate units. Although the EI module uses a high-angle inversion module, there is very little difference between the low-angle and high-angle equations for angles below 200 degrees.

NMR INTERPRETATION MODULE

The NMR Interpretation module allows you to interpret the processed T2 array data produced from any NMR tool. The module gives the setting of T2 cutoff for free fluid and also for clay-bound fluid. Permeability is calculated using Timur/Coates permeability equations. If external permeability data is available, the module provides automatic calibration of the equation.



Tornado plot of Monte Carlo results.

SUMMARY

Interactive Petrophysics has revolutionized the petrophysical interpretation workflow. From one window you have the ability to perform interpretation of NMR, shear sonic, elastic impedance, and fluid substitution data together with everyday log curves interpretation. At the same time, you can estimate interpretation errors using the Monte Carlo module, and missing data using fuzzy logic. All of this and the ability to update and change your cutoffs interactively on the composite display reduces your analysis from hours to minutes.

SCHLUMBERGER INFORMATION SOLUTIONS

Schlumberger Information Solutions (SIS) is an operating unit of Schlumberger that provides software, information management, IT infrastructure, and consulting services. SIS enables oil and gas companies to achieve breakthrough team performance, unlocking the potential of E&P teams to step-change their effectiveness and productivity. Through our technologies and services, oil and gas companies can drive business performance and realize the potential of the digital oil field.

E-mail sisinfo@slb.com or contact your local Schlumberger representative to learn more.

www.slb.com/sis

