

Resistivity Modeling and Neural Network Synthetics— Powerful New Exploration and Development Tools

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The most fundamental application of wireline-log analysis always has been the calculation of formation fluid saturation. The calculation requires accurate resistivity and porosity information.

Historically, although slow and somewhat cumbersome, forward modeling and inversion processing methods have been used successfully to overcome the limitations of resistivity tools used to measure true formation resistivity (R_t). Inexpensive, high-speed PC hardware and vastly reduced processing-time requirements on available software recently have transformed this technique into a practical solution for multiwell applications.

If porosity and permeability information is inaccurate, incomplete, or simply not available, neural networks can provide high-quality synthetic information using data from available wireline logs, cores, or cuttings from nearby wells.

These two new methods represent powerful exploration and development tools. Applications include accurate reserve prediction, completion strategies, reservoir modeling, and the identification and evaluation of bypassed pay zones. Successful applications of these techniques are discussed.