

Formation Evaluation

TMD-L™ Thermal Multigate Decay-Lithology Logging Tool

The TMD-L™ tool is a new-generation pulsed-neutron logging tool which measures the thermal neutron capture cross-sections (sigma) of both the formation and the borehole. The sigma parameter is a measure of the ability of the formation to absorb thermal neutrons. Because of the strong correlation between the open-hole resistivity log and the sigma log, the sigma log is considered to be the cased-hole equivalent of the conductivity log.

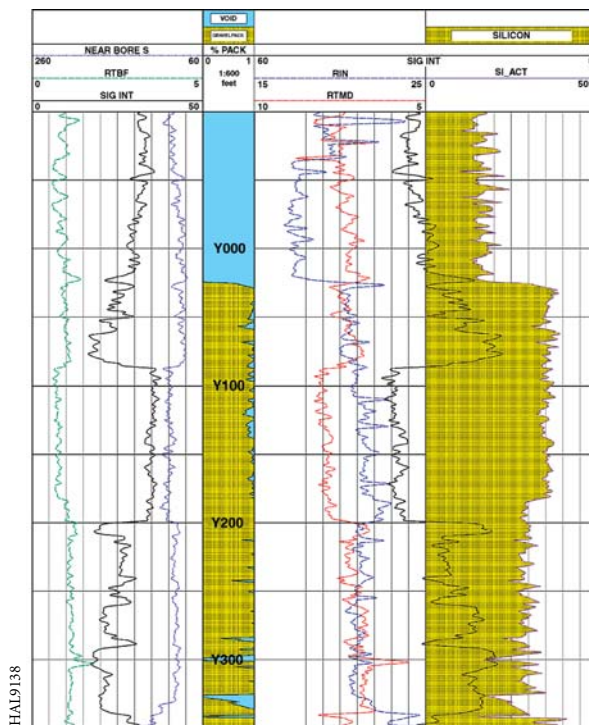
Using induced gamma spectroscopy and decay time measurement, the TMD-L tool determines oil saturation in reservoirs with high salinity. Reservoir monitoring includes measurement of initial and current fluid contacts and predicts how the fluids will move in the future. Accurate monitoring of fluid movement in a producing hydrocarbon reservoir can also yield major economic benefits through improved recovery (such as better reservoir management, better placement of infill wells, and break-through deferral) as well as lower costs from fewer wells and reduced water and gas handling.

The TMD-L tool differs from the competition by applying alpha-processing which optimally combines near and far detector responses to provide a sigma curve with the accuracy of the far detector and the vertical resolution and precision of the near detector.

This leading-edge detector technology results in full spectrum monitoring for greater amounts of information, faster logging speeds, and higher accuracy.

Applications

- Cased-hole formation evaluation
- Lithology determination
- Enhanced oil recovery monitoring
- Gas vs. tight determination
- Water-flow detection



Example of Gravel Pack Evaluation with Silicon Activation

Features

- Larger diameter detectors to produce higher count rates
- Recording of each detector's decay curve with 61 time gates; time gates span the entire burst cycle—from build up through decay
- A different background measurement scheme to sample the background more frequently
- Recording of gamma ray spectra for the far-spaced or near-spaced detectors during several time windows
- Ability to mount gamma ray detector below the generator and running the tool inverted to facilitate water-flow measurements
- Simultaneous inelastic and capture spectral measurements
- Modular hardware design allows custom configurations
- Accurate water saturation interpretation over a broad range of borehole conditions and porosities
- Improved interpretation to help distinguish between gas reservoirs and low-porosity formations
- Improved repeatability, lithology determination, enhanced oil recovery monitoring, and spectral water-flow determination
- Quality indicators for monitoring tool operation and algorithm performance
- Combinable with standard PL sensors to provide extensive interpretation support, save time at the rig site, and provide special tool configurations for special challenges
- Identifies problems earlier to reduce production downtime
- Optimizes and verifies completions for improved production
- Can help recommend remedial activities, such as further stimulation or conformance operations to:
 - Optimize production
 - Estimate reserves for better financial planning
 - Explore old wells for additional reserves
 - Help maximize customer return on investment

Associated Answer Products

- SigmaSat™ sigma saturation analysis
- Chi Modeling® computation service

TMD-L™ Thermal Multigate Decay-Lithology Logging Tool Specifications

Length ft (m)	Diameter in. (mm)	Maximum Pressure psi (Mpa)	Maximum Temperature °F (°C)	Weight lb (kg)
18 (5.5)	1.6875 (42.86)	15,000 (103.4)	325 (162.7)	70 (31.75)