

## RMT Elite™ Reservoir Monitor Tool

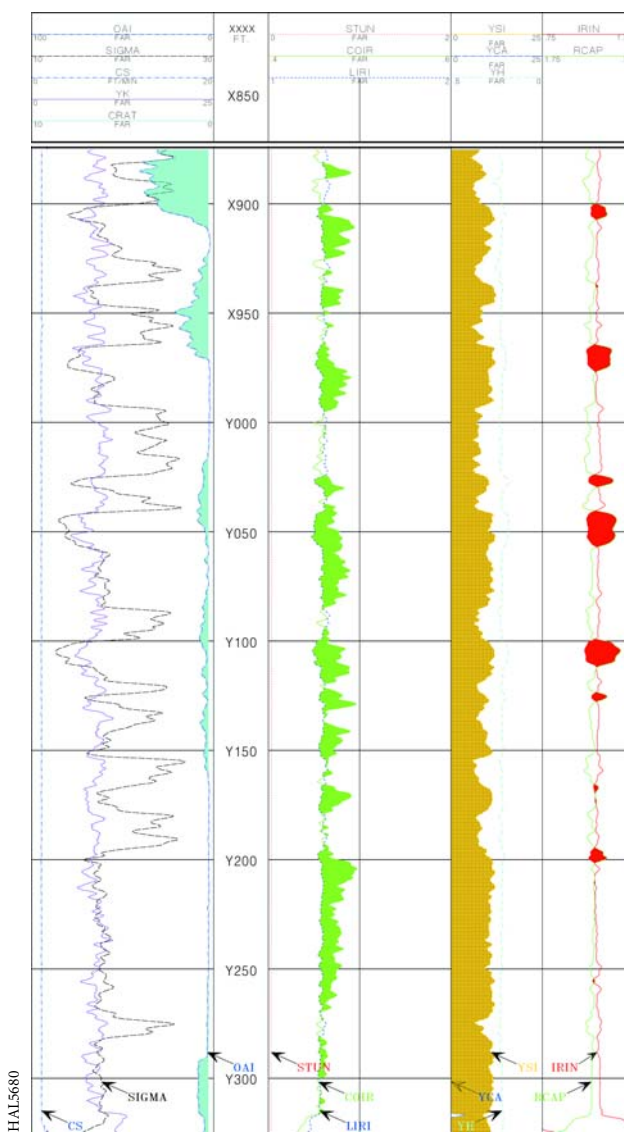
The RMT Elite™ reservoir monitor tool is a unique through-tubing carbon/oxygen (C/O) system, offering two to three times higher measurement resolution than other through-tubing C/O logging systems. Its high-density Bismuth germanium oxide (BGO) detectors allow the RMT Elite tool to achieve resolutions previously available only with larger diameter C/O systems. As a result, the RMT Elite tool can be used to run continuous passes in low porosity formations where other systems can only be run in a stationary mode. The RMT Elite tool can also be conveyed into a well with tubing completions unlike larger C/O systems that can only log through casing.

Utilizing induced gamma spectroscopy and decay time measurements, this pulsed-neutron device is primarily used to determine oil saturation in reservoirs. For reservoirs having low, mixed, or unknown salinity-formation water, the inelastic or C/O mode is used. For higher salinities, the capture mode is used, producing a TMD-L™ thermal multigate decay-lithology-type log. In addition, the RMT Elite tool can be used in either operating mode to perform elemental analyses from the measured spectra to identify lithology in all types of reservoirs.

Because the RMT Elite tool is so accurate and precise, it allows operators to achieve logging speeds two to five times faster than competing systems.

### Applications

- Discriminate formation fluid contacts
- Evaluate hydrocarbon zone saturations in fresh, mixed, or unknown water salinity environments
- Locate water and oil zones in waterfloods where mixed salinities exist between formation and flood waters
- Evaluate saturations in formations behind casings when open-hole logs are not available
- Monitor steam and CO<sub>2</sub> flood/breakthrough
- Inside/outside casing water detection
- Verify gravel pack integrity via silicon activation
- Accurately determine oil and gas saturations in high salinity or fresh water formations
- Identify bypassed reserves
- Pinpoint formation fluid contacts
- Identify lithologies and mineralogies



*RMT Elite™ Primary Log Presentation—Track 1 of the display is used for plotting basic correlation curves. In this example the simultaneously recorded formation sigma and the potassium yield curve (YK) are plotted. Also plotted in the track is the oxygen activation curve (OAI), which is used to detect water flow. Track 2 of the log is used to display the raw carbon to oxygen ratio (COIR) and the calcium to silicon ratio (LIRI). The green shading between the curves is a quick look representation of hydrocarbons. Track 3 of the log displays yield curves computed from the capture spectra for silicon (YSi), calcium (YCa) and hydrogen (YH). Track 4 displays inelastic and capture near to far detector ratio curves. These curves are used to identify gas in the formation (shaded in red).*

## Features

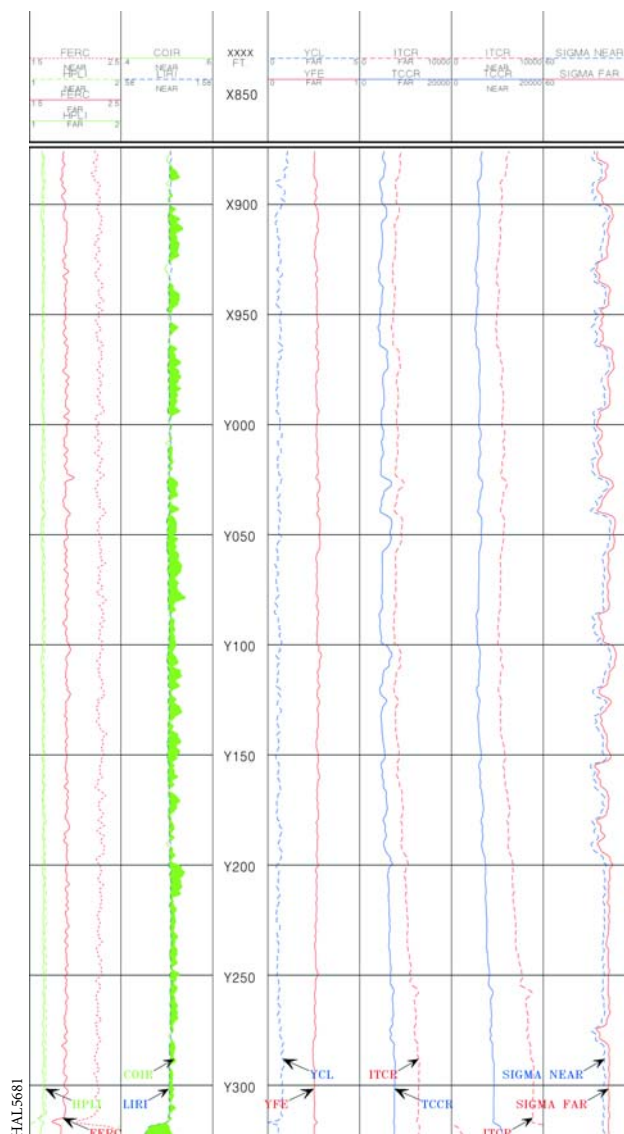
- Below-tubing and in-tubing logging capability without sacrificing quality and accuracy
- 2.125-in. tool size allows use of a large detector and passage through 2.875-in. tubing
- Two detectors provide a near-to-far inelastic ratio, capture ratio, and two C/O measurements.
- Dual operating modes
  - Inelastic mode—(optimized for C/O formation measurements) C/O, elemental yields,  $\Sigma_{FM}$ , porosity from ratios, and oxygen activation
  - Capture mode—(optimized for Sigma formation measurements)  $\Sigma_{FM}$ , elemental yields, porosity from ratios, and oxygen activation
- Accurately evaluates the time-lapse performance of hydrocarbon-producing reservoirs
- No well-kill fluids are necessary

## Associated Answer Products

RMT Elite™ tool data can be used alone in postlogging analysis, however, the addition of open-hole and cased-hole logging data often serves to enhance analysis results. For example, analysis options allow total and effective porosity to be computed from open-hole or cased-hole porosity data, TMD-L™ data, or external inputs. Also, a simple two-porosity log cross plot option is available to improve effective porosity estimates. Formation saturation analysis using the RMT Elite tool and porosity data can be provided via Halliburton's cased-hole formation evaluation interpretation in the following software models.

- CarbOxSat™ model oil saturation analysis using C/O measurements
- SigmaSat™ model water saturation analysis using capture cross section measurements ( $\Sigma$ )
- TripleSat™ model three-phase oil, gas, and water saturations using both C/O and  $\Sigma$  measurements
- Chi Modeling® computation service

Additionally, complex lithology and mineralogy answers can be provided by integrating RMT Elite tool elemental yield data in Halliburton's ULTRA™ multi-mineral evaluation program software.



*RMT Elite™ Quality Log Presentation—Track 1 of the presentation are curves that represent the accuracy of spectral gain stabilization measured from ratios of the iron edge (FERC) and the hydrogen peak (HPLI). Track 2 is a plot of the COIR and LIRI from the near space detector. Track 3 is used to plot additional yield curves computed from the capture spectra. Plotted on this example are the Iron yield (YFe) and the chlorine yield (YCl). Tracks 4 and 5 are used to plot the total inelastic and capture count rates for the near and far detectors. Track 6 is used to plot the simultaneous measured near formation sigma (SGFN) and the far formation sigma (SGFF).*

## RMT Elite™ Reservoir Monitor Tool Specifications

Length ft (m)	Diameter in. (mm)	Maximum Pressure psi (Mpa)	Maximum Temperature °F (°C)	Weight lb (kg)
14.22 (4.33)	2.125 (53.975)	15,000 (103.4)	325 (163)	77 (34.9)