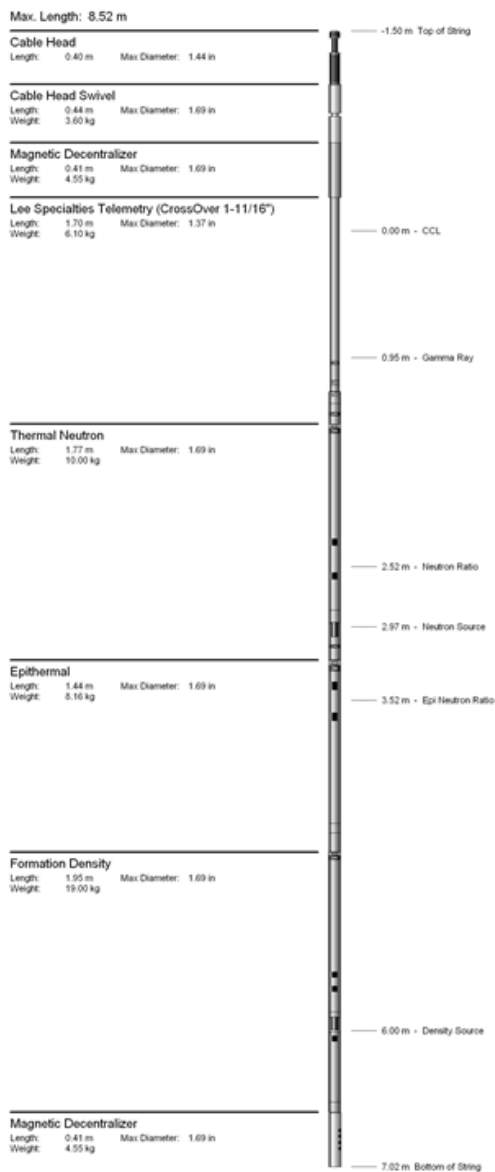


Cased Hole Analysis Tool

Tool String Configuration



The Cased Hole Analysis Tool (CHAT) is a multiple sensor measurement platform capable of providing accurate data about reservoir rock parameters, reservoir fluid identification, and movement behaviour of reservoir and/or non-reservoir fluids in and around the well bore. Through Casing formation evaluation and reservoir fluid monitoring remains an important component of well and reservoir management.

All sensors in the CHAT measurement platform are interfaced into a Lee Specialties telemetry cartridge and are processed for acquisition by the Lee Specialties "Premier Logging System".

- ✓ Cable Head Swivel Assembly – to decouple the rotational force on the tool created by cable torque and thereby prevent the tool from 'rolling off' the casing wall.
- ✓ Magnetic Decentralizer – to achieve decentralization as numerous sensors in the CHAT tool are collimated and are designed to be positioned immediately on the casing wall.
- ✓ Telemetry Cartridge – to processes all of the sensor signal data for transmission to the surface acquisition system. This module also houses the natural gamma ray and the casing collar locator.
- ✓ Behind Casing Density Module is comprised of a focused source-detector combination consisting of 3 detectors. This module is designed to provide 3 main functions; to provide a stand-alone gas detection device when combined with neutron data; to provide behind casing data in problem well diagnostic applications; and to determine formation density characteristics. The density is also used in open-hole to derive density porosities.
- ✓ Dual Energy Neutron Module provides neutron porosity measurement and Sigma profile. The 'dual energy neutron' term refers to complete form of this module (both thermal and epithermal components), it is designed in a manner enabling the removal of the lower epithermal section and allows to gain neutron measurement 0.6m (2 ft.) from the total depth (TD).

Applications

- ✓ Primary porosity measurement (open hole quality)
- ✓ Depletion monitoring of producing reservoirs
- ✓ Evaluation of potential reservoirs
- ✓ Coal bed methane applications
- ✓ Steam flood evaluation and monitoring
- ✓ Problem well diagnostics
- ✓ Dry well bore logging
- ✓ Gravel Pack evaluation
- ✓ Horizontal well bore logging

Features

- ✓ Multiple conveyance methods
 - slick-line deployment
 - wireline logging
 - coil tubing logging
 - co-rod logging
 - drill pipe logging
 - logging while CT drilling***
- ✓ Modular design – results in the most effective and cost efficient tool configuration
- ✓ Measurement compatibility – CHAT physics based on conventional open hole tools. This provides the sensitivity required for accurate time-lapse comparisons
- ✓ Measurement reliability – all components in the CHAT downhole assembly consist of the best quality obtainable resulting in reliable operation within the rated specifications of the equipment
- ✓ Combinability with other tools - Noise logging module can be included to provide noise data to identify fluid movement under dynamic well conditions. Temperature and other P.L measurements can be included in the module below the string.

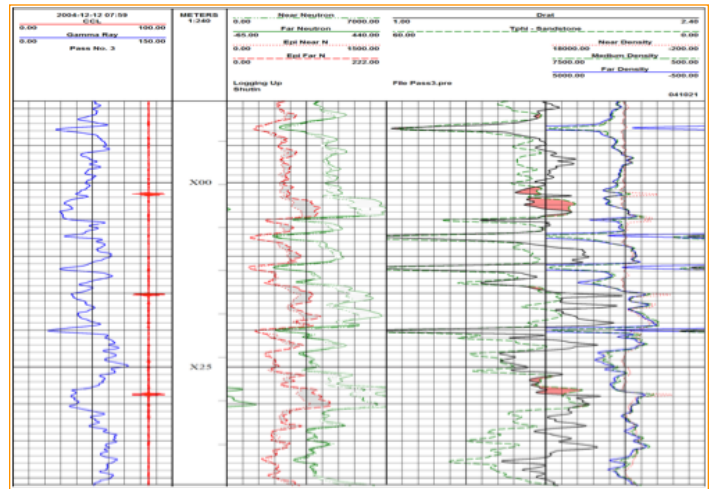
Associated Answer Products

- ✓ The wellsite answer product is comprised of all the 'Raw Data' detector responses in addition to the 'Neutron Porosity' or TPHI, and the ratio of the medium and the far behind casing density detector responses - the DRAT curve.

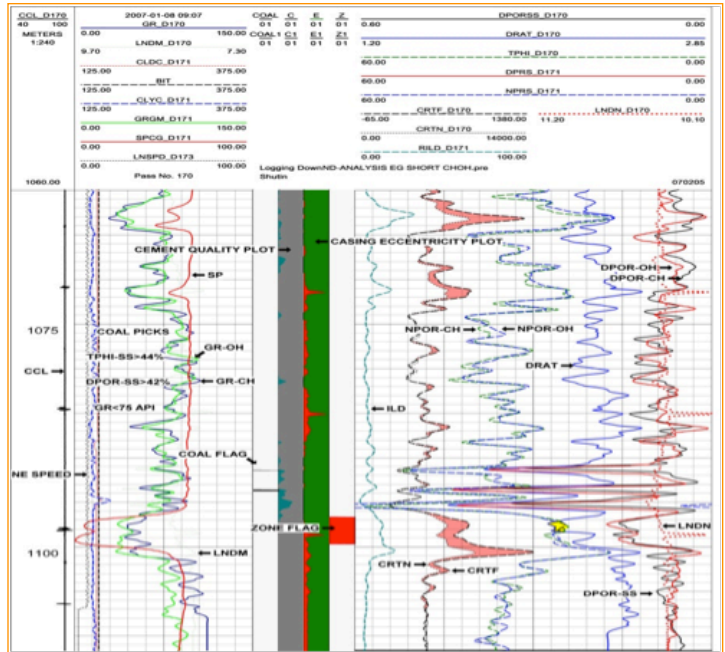
Example of the field log format presented on the right

- ✓ The data office interpretation products include:
 - ✓ Standard analysis
 - ✓ Intermediate analysis
 - ✓ Advance analysis
 - ✓ Other more comprehensive interpretation services

The CHAT computed product is acceptable in place of open-hole logs for submission to the EUB



This illustrates the field log format of the CHAT data that is currently being offered, however, it should be noted that the service provider can tailor the format and data for our individual client needs.



The example shown here of Standard Analysis is for a typical 'Shallow Gas' application. It has four tracks in the center region of the plot; 1 - the 'Coal Flag'; 2 - a relative behind casing cement density plot; 3 - a 'Casing Eccentricity plot; and 4 - a potential gas zone flag (perf advisor), for gas sands that satisfy the Neutron-Density-Vclgr cut-off values.

CHAT Specification Summary

ToolModule	Length		Diameter		Weight		Pressure		Temperature	
	ft.	m.	in.	mm.	lbs.	Kg.	PSI	MPa	°F	°C
Telemetry - Gamma Ray -Series 1	7.33	2.23	1.69	42.9	32	14.5	15,000	103.5	350	175
Telemetry - Gamma Ray -Series 2	4.95	1.51	1.37	34.8	14.2	6.4	15,000	103.5	350	175
Behind Casing Formation Density	6.83	2.08	1.69	42.9	45	20.5	15,000	103.5	320	160
Thermal Neutron	6.08	1.85	1.69	42.9	24	10.8	15,000	103.5	320	160
Epithermal Neutron - Series 1*	6.25	1.9	1.69	42.9	28	12.8	15,000	103.5	320	160
Epithermal Neutron - Series 2	4.56	1.39	1.69	42.9	17.9	8.16	15,000	103.5	320	160
Well Bore Fluid Density - Series 1**	6.25	1.9	1.69	42.9	28	12.8	15,000	103.5	320	160
Well Bore Fluid Density - Series 2	3.54	1.08	1.69	42.9	13.2	6	15,000	103.5	320	160