



Compact™ C-Thru Through-Casing Evaluation Service

Weatherford's C-Thru service identifies and monitors reservoir and borehole fluids using Weatherford's Compact line of 2 1/4-in. tools:

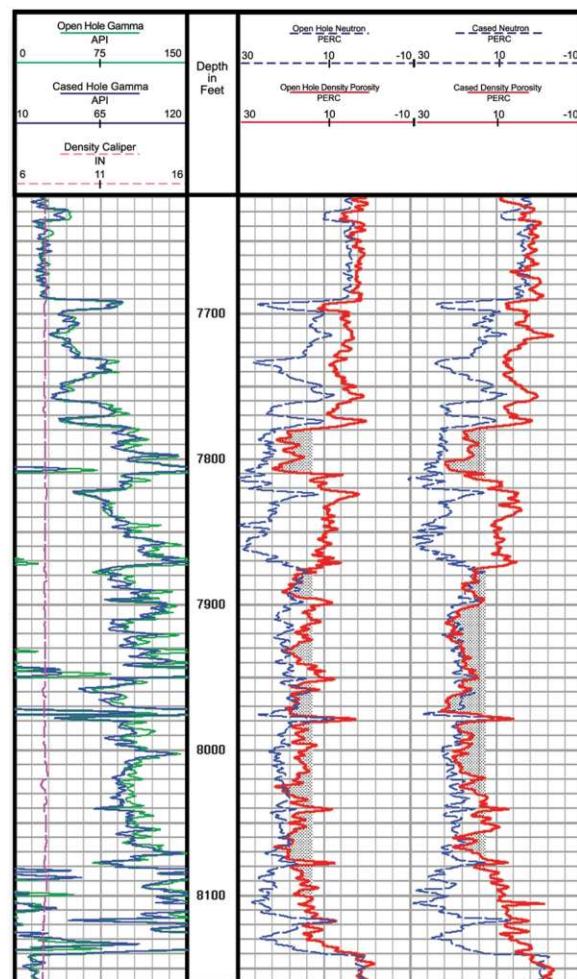
- Dual neutron porosity (MDN)
- Photodensity (MPD)
- Gamma ray and CCL (MCG)
- Battery/memory option (MBS)

In addition, the Sonic (MSS) tool provides cement bond data.

C-Thru service can be run in surface readout (SRO) mode or run without wireline, in the battery/memory mode.

Applications

- Identification and monitoring of reservoir fluids behind casing and tubing
- Monitoring of saturation levels
- Identification of bypassed pay, lithology, and porosity in old wells and wells with limited or nonexistent open-hole data
- Flexible data acquisition with deployment by slickline, standard coiled tubing (without e-line), or drillpipe in high-angle wells
- Acquisition of basic formation evaluation data in cased hole as part of a final run to eliminate intermediate open-hole runs and attendant risks



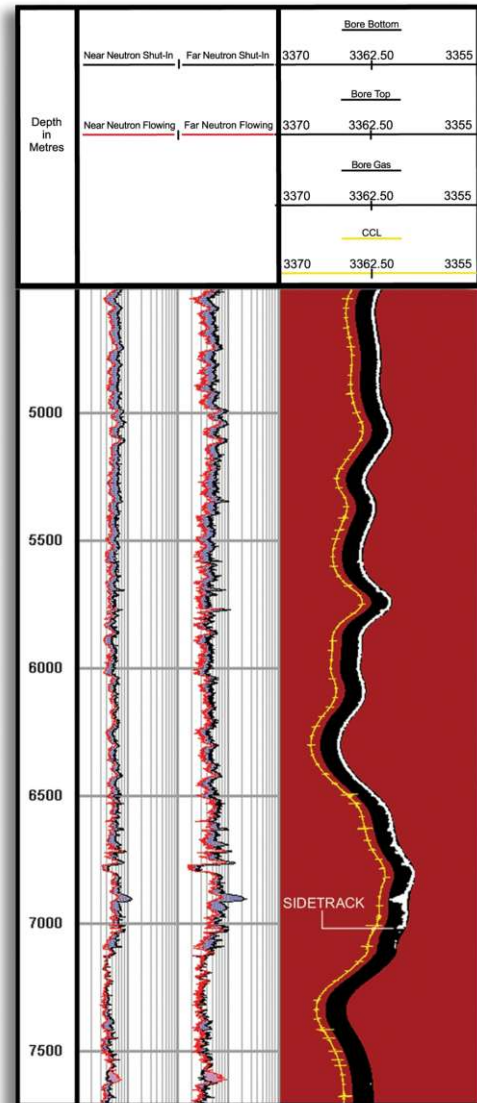
Cased-hole versus open-hole logs, Barnett Shale, Oklahoma. C-Thru processing removes casing and casing collar effects and reduces cement and behind-casing rugosity effects.



Compact™ C-Thru Through-Casing Evaluation Service

Features, Advantages and Benefits

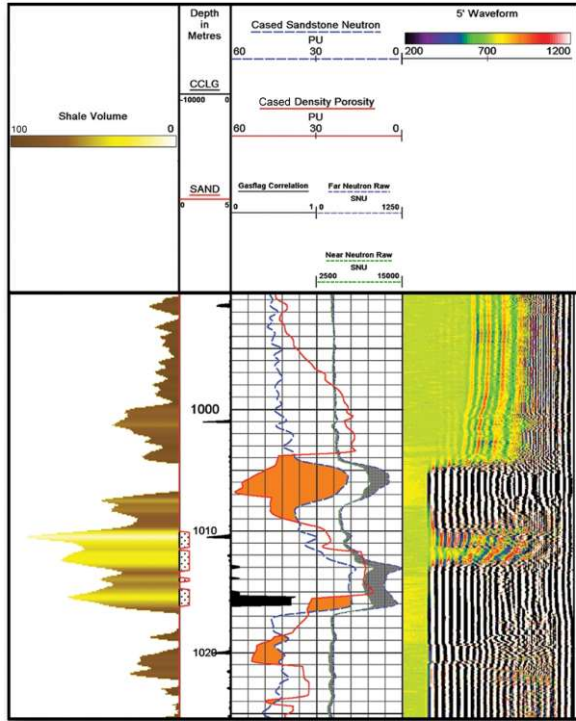
- Running tools in battery/memory mode removes the need for a wireline unit, resulting in significant cost and well access benefits:
 - Smaller crews
 - Less capital equipment
 - Less deck space needed to provide service
 - Lower-weight lifts and fewer lifts
 - Shorter tool strings for reduced riser lengths
- Oil and gas saturations are computed directly from Compact neutron porosity count rate data and guided by Monte Carlo modeling. Monte Carlo modeling of actual downhole conditions enhances accuracy by predicting neutron and density tool responses for specific casing configurations and reservoir conditions.
- Results are not dependent on a good cement bond. Through-casing measurement verifies porosity and identifies gas using a density-neutron crossover technique after explicit correction for casing and cement effects; therefore, this technology works even in poor-cement-bond intervals where conventional neutron-dipole sonic dual porosity methods fail.
- C-Thru service provides fit-for-purpose measurement:
 - Compact neutron can be run instead of a pulsed neutron for reservoir monitoring.
 - Service allows cased-hole neutron to be compared directly with the original open-hole neutron.
 - Gas/water contacts are clearly identifiable.
 - Service allows cased-hole density-neutron formation evaluation where no open-hole data can be obtained.
- C-Thru battery/memory service enhances safety because it requires fewer personnel in high-risk areas, can be run on an efficient conveyance system, and uses an alkaline (rather than lithium) battery.



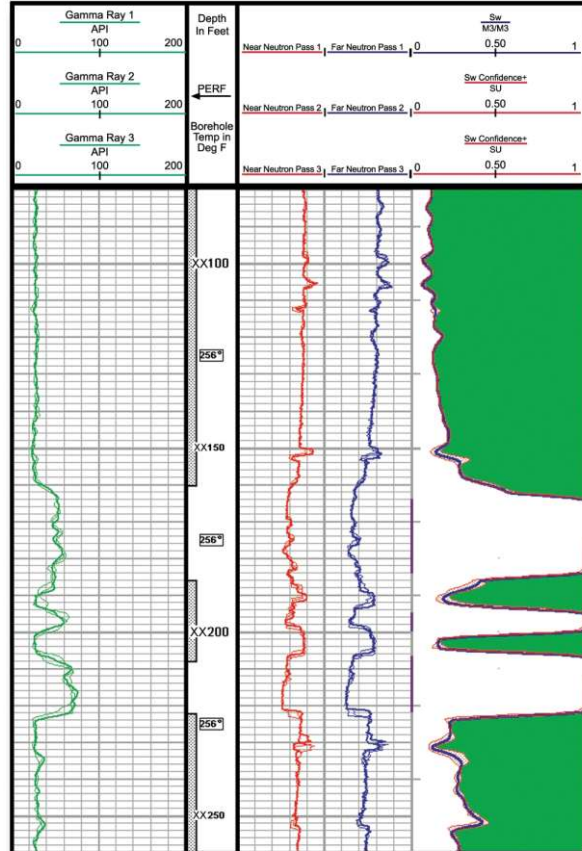
Fluids identification in a horizontal well and sidetrack, U.K. continental shelf, with tools conveyed on wireless coiled tubing. The well was producing unwanted gas. C-Thru service shows oil (black) in the main bore with additional gas (white) above 22,966 ft (7,000 m), where the sidetrack meets the main bore. Identifying the sidetrack as the gas source enabled the operator to prevent further gas production.



Compact™ C-Thru Through-Casing Evaluation Service



Bypassed pay identification, Alberta, Canada. Gas is flagged in two zones; however, the C-Thru cement bond log (CBL) indicates that upper zone gas is present only in the annulus, at the top of an interval of bad cement bond. The dipole sonic/neutron dual porosity technique used previously failed where the cement bond was inferior.



Reservoir saturation monitoring, North Sea gas field, using slickline conveyed tools. Data from three shut-in passes are overlaid: gamma ray (Track 1), neutron count rates (Track 2), and saturation with saturation confidence (Track 3). Five flowing passes were also recorded. A comparison of flowing and shut-in passes also allowed identification of condensate in the wellbore.