Compensated Neutron Tool (CNT)

The CNT (Compensated Neutron Tool) instrument is a radiation logging device used to indicate formation porosity in open or cased boreholes. The neutron source continuously emits fast neutrons. When the fast neutrons collide with the various nuclei in the formation, they lose energy, slow to an epithermal energy level and then to a thermal energy level. The proportional-counters used as detectors are designed to respond primarily to thermal neutrons. For well-logging applications, it is significant that hydrogen is one of the most effective neutron thermalizers. Therefore, a decreasing detector count indicates an increasing amount of hydrogenous material between the source and the detectors. This, in turn, indicates a higher formation porosity.

Specifications

Maximum Temperature	400 °F (200 °C) For 3 hours
Maximum Pressure	20,000 psi (137.9 MPa)
Diameter	$3^{5/8}$ in. (3.63 in.) (92.1 mm)
Maximum Hole Diameter	24 in. (609.6 mm) (limited by decentralizer)
Minimum Hole Diameter	4.75 in. (120.6 mm)
Make-up Length	7 ft. - 7.0 in. (2.311 m)
Shipping Length	8 ft. - 9.25 in. (2.673 m)
Weight	150 lb (68.0 kg)
Maximum Logging Speed	30 ft/min (9.0 m/min)
Typical Logging Speed	18 ft/min (6.0 m/min)
Measuring Range	-3 to 100 Limestone Porosity Units (p.u.)
* Accuracy	±0.5 p.u. below 7 p.u. porosity
	± 7% of recorded value above 7 p.u. porosity
* Repeatability	± 1.5 p.u. @ 15% Limestone porosity
* Applies to a decentralized instrument in a smooth 7.88 inch (200.0 mm) water-filled borehole.	
Depth of Investigation	12 in. (304.8 mm), estimated for a 7.88 in.
	(200.0 mm) water-filled borehole with nominal15% porosity formation
Radial Resolution	N/A
Vertical Resolution	28 in. (711.2 mm) given proper formation
	contrast above and below zone of interest
Measure Point	Short Spacing: 2 ft. - 1.0 in. (635.0 mm)
	Long Spacing: 2 ft. - 6.0 in. (762.0 mm)
	(both measurements are from the bottom of tool)
Tension	122,000 lbs
Compression	78,000 lbs
Wireline Requirements	7-conductor cable
Operating Voltage and Current at Cablehead	
	180 VAC at 65 mA, approx.
Detector or Sensor Type	Proportional counter
Source Type	Am 241-Be 9/ Pu 238-Be 9
Source Strength	18/20 curie - 4.5 MeV Neutrons